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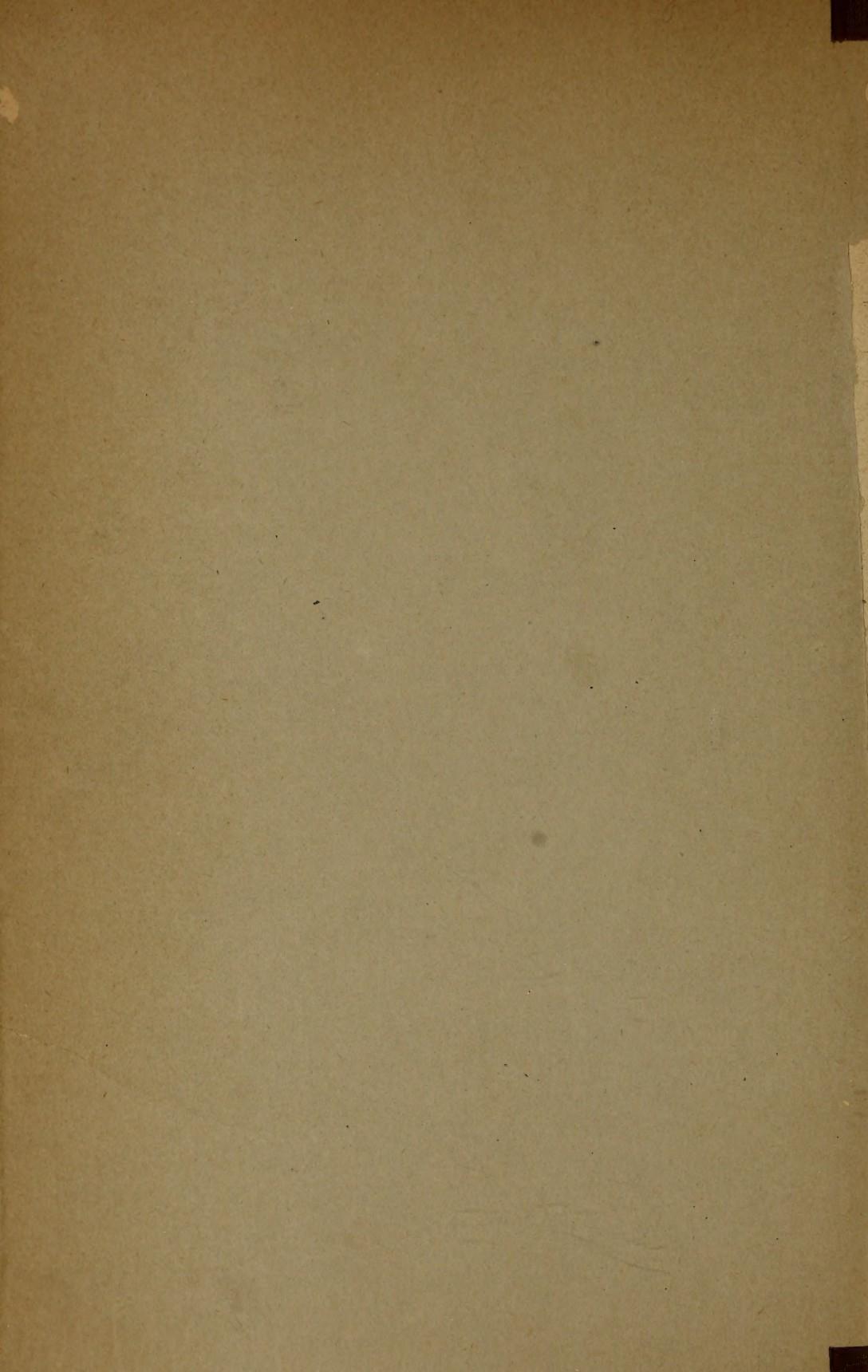


AGRICULTURE AND FORESTRY

BY THE

DEPARTMENT OF AGRICULTURE AND RURAL INDUSTRY

Ministry of Crown Domains





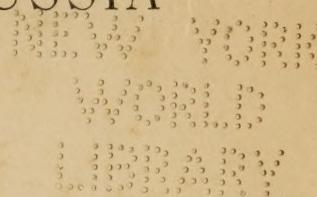


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THE



# INDUSTRIES OF RUSSIA



# AGRICULTURE AND FORESTRY

WITH COLOURED MAPS

BY THE

DEPARTMENT OF AGRICULTURE MINISTRY OF CROWN DOMAINS

FOR THE

# WORLD'S COLUMBIAN EXPOSITION

AT

CHICAGO

EDITOR OF THE ENGLISH TRANSLATION

JOHN MARTIN CRAWFORD

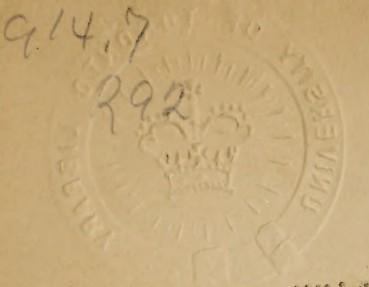
U S CONSUL GENERAL TO RUSSIA

Vol III

ST PETERSBURG

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## PREFACE.

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The present condition of the agriculture of Russia must be of great interest to the people of the United States who celebrate this year the four-hundredth anniversary of the discovery of America. Notwithstanding the great difference in the culture and social conditions, the agricultural industries of both countries have very much in common. In Russia, as well as in the United States of America, farming forms an important source of the popular welfare; both of these countries are the principal suppliers of raw materials to the international markets; in both countries the rural industry is specially characterized by its extensiveness, which only gradually, with the increase of population, by disseminating capital and labour, and with the spread of scientific knowledge, gives place to more perfect ways and methods of exploiting the natural wealth.

A Commission annexed to the Ministry of Crown Domains, and under the Presidency of the Assistant of the Minister, now member of the State Council, V. I. Veshniakov, was formed for the purpose of organizing the Russian Agricultural Section of the World's Columbian Exposition at Chicago. This Commission proposed to edit a book which would help those who visit the Exposition to become acquainted with the state of agriculture, forestry and the household industries of Russia, which form, as has been already mentioned, the principal source of the wealth of the extensive Russian Empire. The former Minister of Crown

Domains, the State Secretary, Mr. Ostrovsky, greatly patronized this idea and invited Mr. V. I. Kovalevsky, Member of the Scientific Committee of the Ministry of Crown Domains and Director of the Department of Trade and Manufactures, to form the general plan for the book and to undertake its publication.

The present Minister of Agriculture and Crown Domains, the Privy Councillor, Mr. A. S. Ermolov, who when he was yet Assistant of the Minister of Finance, took part in forming the present book and wrote a chapter on the systems of agriculture in Russia, and after having assumed his new post, continued his work on this edition. The separate articles of this book are written by specialists.

The Director, V. I. Kovalevsky, invited the Chief Editor of the Statistical Section of the Department of Agriculture and Rural Industry, Mr. D. P. Semenov, and the Editor of the same Section, Prince V. I. Massalski, to help him in the preparation of the work.

This volume contains the characteristics of the main factors and conditions of the farming industries, a review of the present state of agriculture, cattle breeding and other branches of farming, a review of the household industries, of forestry, fishery and a general sketch of the measures taken by the Government for perfecting farming methods.

This work is being simultaneously translated into English, and the Consul-General of the United States of America, Mr. J. M. Crawford, has kindly consented to take upon himself the edition of the English translation.

The Review of the Mining Industry, which is also under the jurisdiction of the Ministry of Crown Domains, is being edited separately, both in the Russian and English languages.

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## PREFACE TO THE ENGLISH TRANSLATION.

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Agriculture is the essential element of success of any country; and the enormous extent of fertile plains, watered by immense river systems, has made farming almost instinctive to the Russian people, since the nomadic tribes took upon themselves permanent abodes, and abandoning their continual petty warfares, gradually centralized into a great nation of which to-day the largest number of its inhabitants are devoted to the tilling of the soil.

An inspection of these pages will disclose a description of the extensive agricultural regions of Russia, as well as of the various methods of practising the several branches of rural economy now in vogue in the different portions of the Empire.

Although not so highly developed as in America, farming has made great progress in Russia, especially since the liberation of the peasants, coincident in time with the abolition of slavery in the United States. This humane act brought with it the need for more scientific and practical methods of farming, among the landowners on the one hand, the cultivation of whose estates was until that time entirely dependent upon unpaid labour, and among the peasants on the other, who were thereby thrown upon their own resources to earn a living out of the plots of ground ceded to them from their respective proprietors. It should be of interest to examine the many and various methods adopted by the Central Government of Russia to aid the peasant population, by serviceable and practical means to cope with the many difficulties lying in the way toward their ultimate independence and full prosperity, such

as the distribution of new seed for their wheat and rye fields, the inducements offered them to use improved types of farming tools, the systematic planting of fruit trees on peasant farms, the introduction of better bred types of live stock, the sending of ambulant schools throughout the different districts to teach the art of butter and cheese making, the planting of forests on the woodless tracts of the Empire, the establishing of Peasant and Government Banks authorized to loan money to worthy and needy peasants against prospective crops, and many other kindred measures to the same end. Improved methods of cultivation, and even American farming implements, have in consequence found their way into the heart of the agricultural regions and are gradually supplanting the primitive methods and hand implements native to this country.

I desire to call attention to the numerous coloured maps and diagrams that accompany this volume, as they will be found of great interest and value, if properly studied. They have been drawn by competent specialists in the service of the Imperial Ministries, such as D. Semenov, A. Fortunatov, P. A. Shostak, A. A. Blau, and by the Department of Agriculture and Rural Economy, and with the utmost pains, to show the different grades of soil fertility, its adaptability to the different crops, to illustrate climatic differences, land values, regions of cattle raising, and other kindred subjects of agricultural and forest interest.

To His Excellency, Mr. V. I. Kovalevsky, Director of the Department of Trade and Manufacture, Actual Councillor of State and President of the Imperial Russian Commission, World's Columbian Exposition, to whom the Ministry of Crown Domains entrusted the duty of formulating the general plan of this volume, and of editing and publishing it in the Russian language, great credit is due for the able manner in which he has conducted the work. To Mr. D. P. Semenov, Chief Editor of the Statistical Section of the Department of Agriculture and Rural Industry, and to the Editor of the same Section, Prince V. I. Massalski,

should be given the fullest praise for the faithful and pains-taking labour they have devoted to the original edition.

As in the Preface to the volumes on Manufactures and Trade, I beg again to remind the reader that this entire series of volumes on The Industries of Russia, for the World's Columbian Exposition, covering in the Russian nearly 1,900 pages, large octavo, has been prepared in the greatest possible haste, so hurriedly in fact that it has been impossible to avoid important errors both in the original and in its translation into English.

With reference to the retention of the Russian weights and measures in this set of publications, I have to say that it was practically impossible, in the very limited time allotted for these translations, to convert them into their English and American equivalents, especially as in all of the originals, both in the tables and in the text, only Russian terms were used. To remedy, as far as possible, this inconvenience to the English reader, a table of English, French and American equivalents will be found at the end of each volume.

In presenting this translation of Volume III of The Industries of Russia to the English reader, it is my hope that it will prove of value, especially to the great agricultural interests of the United States, where, as in Russia, farming is the main-stay of the people. The information herein given on Forestry, on the sugar beet, sunflower, flax and hemp industries, and on other branches of agriculture as yet but little developed in America, will be found particularly interesting and profitable. As this work is based upon authentic, Governmental data, it will satisfactorily answer the numerous enquiries sent to this office by agriculturists in the United States with reference to these subjects; and it was with this object in full view that I undertook the labour of this English edition.

J. M. Crawford.

St. Petersburg, August 10, 1893.



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## RUSSIAN WEIGHTS AND MEASURES.

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The following tables will serve to define the Russian weights and measures in terms of the French Metric System, as also those which are used in the United States.

### I. Long measure.

The lineal measures of Russia have for a unit the foot, which, according to the laws of Peter the Great, is the same as the English foot.

1 Russian foot	= 1 English or United States foot.
"	= 12 inches = 120 lines = 1,200 points.
"	= 0·304794 metres = 30·4794 centimetres.
1 Russian arshine	= 16 vershoks = 28 inches.
"	= $2\frac{1}{3}$ feet = $\frac{7}{9}$ or 0·77778 yard = 0·71118 metre.
1 Russian sagene	= 7 feet = 3 arshines.
"	= 2·13356 metres = 213·356 centimetres.
"	= 2·3333 yards.
1 Russian verst	= 500 sagenes = 3,500 feet.
"	= 1066·78 metres = 1·06678 kilometres.
"	= 0·66269 English mile.
1 geographical mile	= 6·956 versts = 7·420 kilometres.
"	= 4·601 English miles.

### II. Square measure.

1 square sagene	= 49 sq. feet = 4·5521 sq. metres.
"	= 5·4444 sq. yards.
1 dessiatine (Russian land measure)	= 2,400 sq. sagenes.
"	= 1·0925 hectares = 2·6997 acres.
1 square verst	= 250,000 sq. sagenes = 104·17 dessiatines.
"	= 1·1380 sq. kilometres.
"	= 0·43916 sq. English mile.
1 square geographical mile	= 48·38 square versts.
"	= 55·06 "      "      kilometres.
"	= 21·25 "      "      English miles.

**III. Cubic measure.**

1 cubic inch	= 16.386 cubic centimetres.
1 cubic sagene	= 343 cubic feet.
"	= 9.712 cubic metres.
"	= 12.704 cubic yards.

**D R Y M E A S U R E.**

1 chetvert	= 8 chetveriks = 2.099 hectolitres.
"	= 5.9567 American bushels.
1 chetverik	= 8 quarts = 1601.22 cubic inches.
"	= the volume of 64 Russian pounds of water at 13 <sup>1/3</sup> ° R. temperature.
"	= 26.238 litres = 0.26238 hectolitre.
"	= 0.7446 American bushels.

**L I Q U I D M E A S U R E.**

1 vedro	= $\frac{1}{40}$ of a barrel = 10 shtoffs or krouzhki = 750.57 cubic inches = volume of 30 Russian pounds of water at 13 <sup>1/3</sup> ° R. temperature.
"	= 12.299 litres.
"	= 2.707 English or 3.249 American gallons.

**IV. Avoirdupois weight.**

1 berkovets	= 10 pouds = 0.1638 metric ton = 163.80 kilograms.
"	= 0.161217 English tons = 3.2243 cwt.
1 poud	= 40 Russian pounds = 0.01638 metric ton = 16.380 kilograms.
"	= 0.32243 cwt. or 32.243 Eng. lbs.
1 Russian pound	= 32 lots = 96 zolotniks = weight of 25.019 cubic inches of water at 13 <sup>1/3</sup> ° R. in vacuo.
"	= 0.40951 kilograms = 409.51 grams.
"	= 0.90282 English pound.

**T R O Y W E I G H T.**

1 zolotnik	= 96 dolee.
"	= 4.2657 grams.
"	= 65.830 grains, Troy.

**V. Complex table.**

1 rouble paper per dessiatine	= 19.06 cents per acre.
1 " gold " "	= 28.59 " " "
1 kopeck paper " poud	= 31.9 " " ton.
1 " gold " "	= 47.88 " " "
1 " paper " chetvert	= 0.0863 " " bushel.
1 " gold " "	= 0.1295 " " "
1 " paper " poud of wheat	= 1.282 " " "
1 " gold " "	= 1.923 " " "

1 kopeck paper per poud of maize and rice	= 1·197 cents per bushel.
1    " gold    "    "    "    "    "	= 1·796    "    "    "
1    " paper    "    "    " barley	= 1·026    "    "    "
1    " gold    "    "    "    "	= 1·539    "    "    "
1    " paper    "    "    " oats	= 0·684    "    "    "
1    " gold    "    "    "    "	= 1·026    "    "    "
1 rouble paper    "    " flour	= 2·79 dollars per barrel
1    " gold    "    "    "    "	= 4·19    "    "    "
1 kopeck paper    " vedro	= 0·1584 cent per gallon.
1    " gold    "    "    "	= 0·2375    "    "    "
1 poud in a chetvert	= 6·06 English pounds in a bushel.
1 pound in a chetverik	= 1·212    "    "    "
1    " Troy in a Dutch sack	= 0·458    "    "    "
1 chetvert per dessiatine	= 2·2081 bushels per acre.
1 poud    "    "	= 13·377 English pounds per acre.
1 vedro    "    "	= 1·204 American gallons per acre.
1 kopeck paper per poud and verst	= 48·15 cents per ton and mile
1    " gold    "    "    "    "	= 72·225    "    "    "    "



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## INTRODUCTION.

RUSSIA, notwithstanding the striking uniformity of her natural features and physical conditions over wide expanses, cannot be regarded as a whole when reviewing her rural economy. Indeed scarcely any general deductions or broad generalizations in respect to rural life can be applied in its integrity to the vastest of uninterrupted territories belonging to one state, occupying as it does in two parts of the World an area exceeding 407,000 square geographical miles, more than 22,400,000 square kilometres, and embracing for an extent of 10,000 versts from west to east with a broad semi-circular ring almost half the territory of the Earth's globe, situated principally in its temperate and subarctic zones, although extensive continental masses and islands project far beyond the Arctic circle into the Northern Ocean fettered in eternal ice.

In respect to contour Russia presents the same uniformity over wide expanses, and the same variety over the whole of her territory. If the greater part of Russia presents one immense continuous plain intersected only in one meridian by the long but low Ural range, yet in her southern border lands it is infinitely varied with gigantic mountain ranges, reaching on the side of the Caucasus turned towards Europe a limit of 18,000 feet in Elbrus, and in the depth of the Asiatic Continent in Khan-Tengri, in the Russian Thian-Shan 24,000 feet above the sea level.

The conditions of soil in Russia are not less varied. Beginning with the shifting sands, inflicting by their movement in some places considerable damage upon cultivated districts, and ending with läss and chernoziom\* (black-soil), celebrated for their fertility, of which the latter covers about 100,000,000 dessiatines in European Russia alone, the Russian soils present an inexhaustible variety of types, conditions of origin and suitability to agriculture.

The Climate \*\* of Russia, exceedingly uniform over wide expanses, nevertheless on the whole, presents in various parts of the country great differences, expressed for example, in the presence, on the one hand, within the continental territory of Russia, of one of the poles of cold, and on the other, in summer heats reaching in the sandy wastes of the Aralo-Caspian depression the temperatures of the Sahara and Arabia, in consequence of which even the mean temperatures of the hottest and coldest months in

\* See Chapter II and XXI.

\*\* See Chapter I.

different parts of the country present such a vast discrepancy,  $83^{\circ}$ , as is not even to be met with in the British possessions, although they be situated in all parts of the world, in all climates and in both hemispheres. The annual amplitude of the fluctuations of temperature in many localities of Russia surpasses the same in all other parts of the world's surface. On the other hand, places with small annual amplitude so characteristic of tropical countries and of the oceanic climate of temperate latitudes, do not occur in Russia at all.

The vegetative covering of Russia is characterized, like the climate, by great uniformity over wide expanses and by striking variations in the parts of the Empire differing in type from each other. Thus, it was long ago noticed by naturalists that the flora of the whole of the Sarmatian plain, stretching from the German frontier to the Yenisei and even to the neighbourhood of Irkutsk, preserves one and the same character, while on the other hand, the tundra zone on the north of European Russia and Siberia, the sub-alpine and Alpine zones of the Caucasus, Altai-Sayan, Thian-Shan and Pamir, the sea-shores of Colchis and of the Eastern slopes of the Talysh mountains near Lenkoran, the Aralo-Caspian depression with its barren steppes and sandy deserts, appear like quite distinct worlds in respect to their vegetation. The same, although somewhat smaller differences show themselves also in the distribution of cultivated plants. While in the zone of tundras in the realm of mosses and lichens no tillage is possible, and in the forest zone the cultivated areas do not exceed from 10 to 20 per cent of the space, in the chernoziom zone of European Russia in some places more than 80 per cent of the surface is under the plough and in the extreme south, upon the artificially irrigated submountainous cultivated oases rice and cotton ripen.

The animal kingdom, like the vegetable, is characterized over wide expanses by uniformity, and for the most part belongs to the various zones of the Palearctic region. Only in the extreme south and south-east do there enter into its composition representatives of the Indian fauna, which have wandered in these parts far to the north of their home. The most typical animals of the extreme north of Russia are the white bear and the morse; the most remarkable animal in the south and south-east is the tiger. In some localities of Russia up to the present time animals have been preserved, long since extinct in other countries. To such species belongs among other cases the zubr (*bos urus*), living in the woods of the government of Grodno and here and there in the Caucasus. Tundras, forests, steppes and deserts are till now inhabited to a considerable extent by wild animals, which only partially in European Russia, where the population is dense and much land is under cultivation, yield place to domestic animals and gradually disappear.

On the immense expanse of Russia live more than 110 nationalities belonging to various branches and groups of the Mediterranean and Mongolian races. Nevertheless the Slaves constitute about three-quarters, and the chief representative of the latter, the Russian people, about two-thirds of the whole population. The density of the population, very considerable in the west, in the central and western part of European Russia, gradually declines towards the south, east and north, becoming insignificant in the whole north of the Empire and in the vast steppe deserts of Central Asia, in consequence of the unsuitableness of the latter for permanent cultivation.

Such being the vast extent of Russia and such the variety of the racial composition of her population, the actual character of the working of the natural resources of

the territory it occupies, presents great differences due partly to the natural conditions of the country and partly to the level of civilization attained by the population, whose passage from one state of cultivation to another is attended with great difficulties. In Russia till now the primitive forms of man's activity, hunting, trapping et cetera, are still preserved among some tribes. Vast expanses of the country are occupied by races whose sole wealth and fortune are their herds and flocks. Finally, a considerable portion of the population finds the means of existence in the pursuit of various branches of industry, but most universal, wide-spread and important is agriculture. Only in the extreme north, on the borders of the forests, in the region of tundras, and in the south, in the steppes, where agriculture for reasons of climate and soil in the majority of localities is impossible, does it yield the first place to various branches of stock raising. And yet even there, in particular in the Central Asiatic steppes, latterly the nomad Kirghiz is trying to till the ground, leads water into the fields, sows corn, and even to some extent, where natural conditions are favourable thereto, little by little becomes settled. Such a wide dissemination of agriculture and the almost exclusive occupation therewith of the vast majority of the population are explained by many natural and economic conditions in Russia. The mildness of the climate, favourable to the cultivation of many plants, great expanses occupied by fertile soils, the evenness of the ground, the scanty population, and consequently abundance of land, finally the immense predominance of the rural population, possessing land, and a multitude of other causes are propitious in Russia to agricultural occupations, and determine their primary importance.

For the convenience of surveying Russia from an agricultural point of view, it is necessary first of all to separate that part of it which is original, namely European Russia, in which dwell 83 per cent of the population of the whole Empire upon 23 per cent of the latter's surface, from the Asiatic possessions, to which belong: 1. Siberia in the wide sense, that is, original Siberia with its three border lands, Yakutsk, Amour-Littoral, and Steppe-Kirghiz; 2. Turkestan with the Transcaspian territory; 3. The region of the Caucasus.

The present summary is devoted mainly to European Russia. Siberia is the subject of a special sketch, forming part of this series of publications, undertaken by the Ministry of Finance for the World's Columbian Exposition. The outline of the region of the Caucasus and of Turkestan with the Transcaspian territory is set forth in Chapters XX and XXI of this Volume.

There is no doubt but that European Russia, both in its geological contour and in its physical conditions, presents greater homogeneity than the vast Asiatic possessions of the Russian Empire and in particular than the Caucasian isthmus, in which nature itself has brought together within a comparatively small space the most striking contrasts. Nevertheless it is not possible in a sketch devoted to rural economy to survey as one whole a country extending from the nearly always ice-bound Yugorsky Shar and Kara Sea to the nearly always open ports of the Crimean peninsula, from the labyrinth of the lake basins of Finland alternating with granite rocks, to the absolutely waterless sandy Kalmyk steppes of the Astrakhan government.

European Russia presents a vast plain, whose average altitude above sea level does not exceed 80 sogenes and accordingly equals the height of the obelisk erected in Washington in honour of the founder of the greatness of the United States. Only along the whole eastern side of this plain does there rise the unbroken but low range of the

Ural, everywhere easy of passage, and in consequence of this, not separating but by the working of its mineral wealth, closely uniting both its slopes, in Europe and Asia, whence it is that the administrative boundary of European Russia has been projected in the centre of the range beyond its limits. In the midst of the European Russian plain pass two hilly ridges from north to south, of which one separating the basins of the Dnieper and Western Dvina from those of the Volga and Don, bears the name of the central Russian elevation, and the other following the right bank of the Volga, is called after that river. Finally, a scarcely perceptible ascent severs the basin of the Volga from the basin of the Northern Dvina. These elevations, filling the greater part of European Russia with their endless ramifications are nevertheless so low that their highest points do not rise above 180 to 190 sogenes. The striking levelness of European Russia comes into still more prominent relief if it be remembered that the principal rivers taking their rise within the country and running sometimes a course of a thousand versts spring from elevations about 100 sogenes above the level of the sea.

European Russia is abundantly supplied with rivers, flowing slowly, taking different directions and attaining in some cases remarkable lengths. The chief inconveniences of the Russian rivers, taking their rise in woody and swampy spots, consist in their becoming very shallow in summer and being long covered with ice. Besides this, the Volga, the queen of the rivers of European Russia, whose length is equal to 3,343 versts, and the surface of whose watershed is 1,281,958 square versts, falls into a distant sea, it is true almost surrounded by Russian possessions, but closed on every side. But, on the other hand, the disposition of the rivers, flowing in different directions, and closely approaching each other in their head waters, has made it possible to unite them by canals and so connect the northern and western seas with the southern. The importance of the canals and of the water communications in general has diminished in proportion to the development of the railway system in European Russia, but has not disappeared, and some of them even to-day possess an enormous significance for the industry and trade of the people.

The remarkable uniformity of the contour of the plain of European Russia in connexion with its equally uniform climatic conditions determines to a considerable degree the character also of its vegetative covering. In fact, the most characteristic and general feature of the vegetation of European Russia is its uniformity. Nevertheless in view of the vastness of the country and its considerable extent from north to south, its flora, presenting as it does at certain times very essential differences in parts remote from each other, enters four natural botanical regions. The most northern is the Arctic region; then follow in order towards the south the forest, steppe and Mediterranean regions. The first and last botanical regions occupy the least space, the first in the north and the last in the extreme south, on the southern shore of the Crimea. The remaining area is occupied by two floras, the forest and the steppe. The boundaries of the majority of the botanical regions in consequence of the conditions of contour and climate are much less abrupt than, for example, in Western Europe. On the other hand, the typical peculiarities of each flora, covering immense surfaces, are in European Russia clearer and more convenient for investigation.

The Arctic flora embraces, besides the islands, lying in the Northern Icy Ocean, almost the whole littoral of the latter to the south to the confines of the forests\*. The

\* See Chapter XV.

absence not only of forest but even of trees, the excessive poverty of vegetable species and the almost universal prevalence of mosses and lichens form characteristic features of this flora. Such predominance, especially in the eastern part of the Arctic region, lends a special aspect to the country, which presents the appearance of endless grayish and brownish damp plains, almost continuously clad with mosses and lichens and which are called tundras. However poor the flora of the tundras, it yet yields man the possibility of living here, as the reindeer, the animal upon which rests the welfare of the sparse local population, is nourished on this scanty vegetation. Meadows in this region there are scarcely any; herbs grow in distinct swards of turf, and from the abundance of their bright and mossy blossoms even in the extreme north lend here and there a liveliness to the scene. In some parts of the tundras various species of raspberry are met with in abundance, of which the cloudberry (*rubus chamaemorus*), covering the tundra in immense quantities with its yellow fruit, yields both a delicacy and an important article of food to the Samoyeds and other northern tribes. The majority of the dwarf shrubs (*salix*, et cetera), occurring here and there in the Arctic region, spread upon the ground or even under the ground, exhibiting on the surface only small twigs upon which during the brief summer a few leaflets and flower tassels burst forth. The whole Arctic zone of European Russia is unfitted for agriculture. Only here and there in the south on the borders of the forests the inhabitants essay to grow garden vegetables.

The forest botanical region of European Russia occupies an immense area. Beginning in the north at the limit of forest vegetation it extends to the south to the beginning of the steppes, its passage into steppe being even less abrupt than to the north into the Arctic flora. The chief peculiarity of this vast region, as is indicated by the name itself, is not only the predominance in it of forests, in the north coniferous in the south foliage trees, but also of considerable expanses of meadow, mainly adapted to the river valleys, watered in spring, in consequence of the melting of the snows, by the overflowings caused thereby. The composition\* of the woods of the forest region, from the small number of species forming them, is remarkably monotonous, and forest landscapes of localities distant thousands of versts apart, bear on the whole an identical character. The predominating species in the north are the conifers, the pine and the fir; and in the south, the oak. In some places in the east the linden also plays an important part, and in the extreme west the beech occurs, the most characteristic tree in the forests of Western Europe, but in European Russia to be met with only on the western frontier and in the Crimea. Among the species enjoying the widest range may be named the pine and birch. The former goes far to the south and is found in the northern parts of the steppes, the second is met with in almost the whole forest region. The once impassable and interminable forests of European Russia, at the present time in consequence of the growth of the population and industry, and also improvident destruction, have become grievously thinned. Nevertheless even now in the remote unknown spots of the north and north-east, forests still cover immense spaces, among which the only roads are the rivers, fenced about on their banks for hundreds of versts with unbroken walls of trees. In the forest region, agriculture is possible almost everywhere, and the cultivated plants, consisting of barley alone in the north, become very various

\* See Chapter XV.

in the south. Nevertheless the most characteristic field plants of this zone, whose cultivation embraces the widest areas, must be admitted to be rye and oats. Cattle raising, closely connected in this region with agriculture, in consequence of the abundance of meadows is fairly extensive, in many localities has a great importance and furnishes in the main dairy produce and manure for the dressing of the northern poorly fertile soils.

Between the forest region in the north and the steppe in the south stretches a fairly broad zone, the sub-steppe, where not a few forests are still to be met with, separated from each other by expanses of steppe, and where so to say a struggle is going on between forests and steppe vegetation. Thus the limit of the forests has nothing abrupt about it. In some places the forests penetrate deep into the steppes, while in others the steppes plunge into the forest undergrowths and thickets. In many cases man is a party to this struggle. In consequence of the destruction of the forests, especially noticeable in this transition zone, the steppe vegetation has in places moved forward further than formerly to the north. To the south of the transitional zone, up to the shores of the Black Sea, over a vast area is stretched a treeless, lightly rolling plain, here scored with deep gullies, there smooth and level for hundreds of versts, covered in the main by a herbaceous steppe vegetation, or in some parts also by steppe shrubs and forming the so-called steppe or prairie. The most characteristic steppe forms are feather-grass (*stipa pennata*), *tyrsa* (*stipa capillata*), dwarf almond (*amygdalus nana*), cherry (*prunus chamaecerasus*), *chilizhnik* (*caragana frutescens*), and others. The real high steppes are so bereft of woody vegetation, that their horizon, sometimes for many hundred versts, is not broken by a single tree. Only in the deep ravines and along the valleys of the rivers intersecting the steppes, where the conditions of moisture are more favourable, thick growths of shrubs find shelter and clumps of trees lift their heads. The steppe, as yet untouched by the plough, strikes the observer with the wealth and beauty of its flora, the rapid changeability of its colouring at different seasons of the year and the abundance of animal life. The white shroud of the snow mantle passes away under the hot rays of the spring sun in a few days, disclosing to view the yellowish brown herbage of the past year. A week later the new grass clothes the steppe with an emerald carpet, upon which after yet a few days brilliant flowers, opening out in countless numbers, form varicoloured and fantastic patterns, here and there broken by the rosy white masses of the thickets of dwarf almond and cherry. The steppe flowers and tender spring herbs quickly fade and wither away under the scorching rays of the sun. They are in turn succeeded by the feather grass (*stipa*) spreading its downy silvery plumes, waving and quivering with the slightest breeze. In the height of summer, in consequence of the burning rays of the sun and the lack of rains, the vegetation becomes scorched, the plants become yellow and dry up, the flowers vanish and the whole steppe assumes a monotonous, yellowish brown tinge, upon which here and there stand out clumps of high steppe-grass (*burián*) withstanding the drought, thanks to their organization and deep roots. Sometimes, in autumn, when the heat slackens and rains fall at intervals, the steppe becomes alive again and is covered with fresh turf, but this return to life is not enduring; the autumn frosts soon kill the herbage, and still later the snow covers the whole steppe with a white pall. In the south-east the steppes have a somewhat different character. The abundance of salt marshes and excessively dry climate determine a peculiar flora, which lends to such localities during the whole spring and summer a monotonous, dull colouring. During the last few decades tillage has greatly

altered the steppe region. The untouched virgin steppes with their peculiar vegetation and life in the majority of places have already vanished, yielding room to endless fields of wheat and other kinds of grain. The virgin steppe is preserved only here and there in unfrequented spots, where the population is thinner and where the plough has not broken up all the land possible \*.

The steppe region is fitted for the cultivation of a great variety of plants, the vine included, but the most characteristic of it is wheat, whose production here is enormous. After agriculture, a great importance for the whole steppe region is possessed by cattle raising, whose chief products are meat and wool.

The most southern botanical region of European Russia is the Mediterranean region, occupying the southern shore of the Crimea, to the south of the short ridge of the Crimean mountains running parallel to the southern shore of the Crimea. It is characterized by several broad-leaved evergreen plants like the olive, peculiar to Southern Europe, and among other things by the highly developed cultivation of fruit trees and the vine. The warm winters of the southern shore of the Crimea are easily stood by even such southern plants as the magnolia, paulownia, bamboo and some species of palms.

The peculiarities of the soil, climatic and economical conditions of the different parts of European Russia come out yet more distinctly on examining each such part separately, and almost always determine not only the agricultural mode of life of the local population but its whole activity in natural dependence upon it.

The roughest, and at the same time generally accepted division, is that into two zones, the northern non-chernoziom and the southern chernoziom \*\*. Such a division, based on the peculiarities of soil, is also determined by the fact that the whole cast of the life of the population of these two parts of European Russia presents essential differences. It will be sufficient to point out that in the chernoziom zone the principal source of the prosperity of the population is agriculture, yielding here immense surpluses of grain, while in the non-chernoziom zone, in consequence of the poorness of the soil, industry of every kind has a great importance, and some localities of this zone are forced to be content with grain imported from the fertile chernoziom regions of European Russia.

But independently of this broad division, on an examination of the various sides of the agricultural life of European Russia, the necessity was seen of dividing it in several more or less natural regions, embracing the governments where the activity of the population in consequence partly of the conditions of physical geography and partly those of the history of civilization bear approximately one and the same character.

These regions, excepting the governments of Finland, which form a distinct administrative district, are the following: the Central Agricultural, Middle Volga, Little Russian,

\* More detailed information on the Russian steppes is to be found in a special publication in English of the Department of Agriculture and Rural Industry, "Russian steppes", by Prof. V. V. Dokuchaev, of this series.

\*\* In consequence of the importance of this division, upon all the maps in the text the northern limit of the chernoziom zone is represented by a black line trending from south-west to north-east. See also the map, appended to Chapter II.

South-Western, Novorossisk, Lower Volga, Moscow Industrial, White Russian, Lithuanian, Vistula, Baltic, Lake, Extreme North and Ural \*.

I. The Central Agricultural region embraces the governments of Kursk, Orel, Tula, Riazan, Tambov and Voronezh, occupying the plain, here and there hilly and intersected by gullies, in the basins of the upper and middle Oka, and the upper Don and Desna. The soil is mainly chernoziom and fertile. Only on the northern borderland of the region, forming the transition to the non-chernoziom zone, do clayey and sandy soils predominate, in dependence upon which industry in general and also the treatment of agricultural products here have a great importance, while in the chernoziom parts of the region, agriculture constitutes almost the sole source of the wealth of the population. The latter is on the whole pretty dense, being 2,400 souls to the square geographical mile. In all the governments more than half the land belongs to the peasants. Arable lands occupy as much as 70 per cent of the whole area, and on the peasant plots this proportion in some governments reaches 90 per cent. The reigning system of agriculture is almost universally the three-field system; the principal grains grown are rye and oats, followed by buckwheat and millet; in the south-east upon the landowners lands much wheat, both winter and spring, is sown. The chernoziom is beginning to be manured throughout nearly the whole region. In the eastern half of the region flax is widely cultivated; and in the north and north-west, hemp. The latter reaches in some parts, namely in Orel and the northern districts of the Tambov government, the most considerable extent in Russia. In the government of Voronezh much sunflower also is sown, and here and there the cultivation of tobacco is to be met with. In some localities the potato is grown. Horticulture is developed in a few spots, but exclusively on the landowners estates. There are few forests; their area does not exceed 20 per cent of the whole surface, and in the south falls to 10 per cent and even lower. Cattle raising is but moderately developed in consequence of the lack of meadows, and commons, in fact pasture of any kind belonging to the peasants or even the landowners. In reference to the number of horses, the central agricultural region is the most normal of all European Russia, there being here 25 horses per hundred inhabitants. This proportion far exceeds the same in the countries of western Europe and is equal to that in the United States of America. Horse breeding has the greatest importance in the governments of Voronezh and Tambov; in the southern part of the former sheep farming is highly developed. There are but 15 head of horned cattle per hundred inhabitants, and 50 sheep, which is explained by the deficiency of pastures and the insufficient sowing of artificial grasses.

II. The Middle Volga region embraces the governments of Simbirsk, Saratov, Penza, Kazan and Nizhni-Novgorod, occupying a fairly varied, on the whole, undulating country, situated along the middle course of the Volga principally on the right bank and also on the lower courses of the Oka and Kama. In the north prevail northern stingy soils, in the remaining part chernoziom, salt marshes being met with in the south accompanied by soil but illsuited to agriculture. The density of the population, in which the Great Russian element prevails, is much lower than in the preceding region, forming

\* This division introduced by the Central Statistical Committee of the Ministry of the Interior, has lately been accepted also by the Department of Agriculture and Rural Industry of the Ministry of Crown Domains.

not more than 1,600 inhabitants to the square geographical mile, and falling off considerably to the south. The predominating occupation is agriculture. Various forms of industry are particularly developed only in the government of Nizhni-Novgorod in the north of the region. About half of the land belongs to the peasants and is, as in the Central Agricultural region, owned in common. Arable lands occupy 55 per cent of the whole area. The system of farming in the majority of localities is that of three fields, waste farming only occurring in the south. The principal grains are rye, oats and, in the south here and there, spring wheat. In some governments, as Simbirsk and Kazan, fields of spelt (*triticum amyleum*) are fairly common, a very rare cereal in European Russia, while in a few spots a considerable importance is possessed by buckwheat, millet and sunflower. Of the other field plants flax, excepting in the north-east, and hemp, in Simbirsk and Penza, are sown. There are far more forests in this than in the agricultural chernoziom region, namely as much as 28 per cent of the total area, this proportion rising in the northern half of the region to 38 per cent, and falling in the southern to 12. In the northern wooded portions of the region forest industry is highly important. Cattle raising has attained on the whole a not greater development than in the agricultural chernoziom region, but the difference is only in this, that the number of horses is somewhat less, below 20 per hundred inhabitants, in consequence of the fact that the region possesses no such studs as those for which the governments of Voronezh and Tambow are celebrated. On the other hand, there are more horned cattle, namely 20 per 100 inhabitants, while the number of sheep is relatively the same, 50 per hundred.

III. The Little Russian region, consisting of the governments of Kharkov, Chernigov and Poltava is situated on the left bank of the Dnieper and its tributaries, and in part along the upper course of the Donets, and presents in the north a comparatively level, in the south a somewhat rolling country, intersected with gullies. In the northern part of the Chernigov government argillaceous sandy and forest soils prevail, while in the remaining parts chernoziom predominates. Forests in any considerable quantity are met with only in the Chernigov government, 22 per cent of the area. In the remaining governments, especially in that of Poltava, they are very rare, so that their total area does not exceed 9 per cent of the whole.

The relatively dense population, 2,500 inhabitants to the square geographical mile, thickest in the government of Poltava, consists mainly of Little Russians, and is principally everywhere employed in agriculture. In the possession of the peasants (almost exclusively on the homestead system, and hereditary in contradistinction to the two preceding regions) are about 47 per cent of all the lands. The three-field system prevails, although here and there are met with crops of roots, such as beet, and artificial grasses, and in the south in a few spots the resting-system of farming has maintained itself to this day. Field labours are mostly carried on by oxen. Arable land occupies about 62 per cent. In the north, crops of rye, buckwheat and oats predominate; in the east, rye, wheat and barley; and in the south-west, wheat, chiefly the spring variety, rye and barley. Of other plants the greatest importance is attached in places to tobacco, namely in the governments of Chernigov and Poltava, hemp and buckwheat, which is sown in the government of Chernigov in very considerable quantities. In some parts also cattle raising is important. The government of Chernigov is hardly satisfied with its own grain, the remaining governments yield considerable surpluses. Of the

branches of stock raising, horse breeding is incomparably less developed than in the two preceding regions, there being not more than 12 horses per 100 inhabitants in the said region. On the other hand the breeding of horned cattle and sheep farming in some parts possess greater importance than in the neighbouring agricultural chernoziom region. There are 25 head of the former, and 50 of the latter per 100 inhabitants, as in the Middle Volga region. Industry has some significance in the non-chernoziom portion of the Chernigov government, while in the remaining parts of the region it is but feebly developed and mainly directed to the treatment of agricultural productions.

IV. The South-Western region, including the so-called south-western governments of Volyn, Podolsk, and Kiev, occupies a hilly country along the upper courses of the Dniester and Bug, the middle course of the Dnieper, on the right bank, and the right tributaries of the river Pripyat. The population in this region, consisting mostly of Little Russians, is very dense, 2,600 inhabitants to the square geographical mile, especially in the governments of Kiev and Podolsk, where it attains 3,000 inhabitants per square geographical mile. This in conjunction with favourable conditions and a soil fertile in the majority of localities has determined here a comparatively high development of the agricultural art. In respect to the conditions of farming this region may be divided into three parts. The northern part is thinly populated, furnished in abundance with woods, swamps and sandy or clayey soil. The essential employment of the local population excepting agriculture, that is the cultivation of rye and oats, is forest industries. The forests cover in all 25 per cent of the total area of the region, and in the government of Volyn, 32 per cent. The central and partly the southern portions are very thickly inhabited, have a fertile chernoziom soil and yield very various field produce, among which besides grain, beet occupies the first place. In this region about two-thirds of all the sugar obtained in Russia is produced. About 43 per cent of the whole area of the region are in the possession of the peasants, almost exclusively on the home-stead hereditary system. In many estates belonging to the landowners there exists the many-field system of farming, with the sowing of crop of roots and artificial grasses, but the majority of the population clings to the three field system on account of various conditions. Field labours are mainly carried on by the aid of oxen. Arable lands occupy on an average 50 per cent, and in Podolsk as much as 63 per cent. The principal grains sown are rye, winter wheat, and oats. The cultivation of beet has a great importance for the region, as also horticulture in some parts. Cattle raising is developed to a very considerable extent. To every 100 inhabitants there are 20 horses, 23 head of cattle, and 37 sheep. The industry of the country is concentrated mainly in the treatment of agricultural products, such as the beet sugar industry, spirit distilling, et cetera.

V. The Novorossisk region embraces the governments of Bessarabia, Kherson, Taurida and Ekaterinoslav and the territory of the Cossack levies of the Don, and is accordingly situated in the extreme south of European Russia. The Novorossisk governments present a vast steppe, comparatively poorly watered plain gradually falling to the south, intersected by the lower reaches of the Don and Dnieper, and also by the Bug and Dniester, hilly along the right side of the Donets and mountainous between the Dniester and Prut, the Imperial frontier, whither extend spurs of the Carpathians. In the extreme south of the Taurida peninsula the Crimean mountains form an independent ridge. The soil is mainly chernoziom, in the east here and there saline, and in

the lower waters of the Dnieper sandy. The population among which the Great Russian element predominates, has now already reached 1,300 inhabitants per square geographical mile and is rapidly increasing, especially on the frontiers of the two preceding thickly populated regions. The most considerable employment of the population is agriculture. Industry is but feebly developed, and only here and there has mining a great importance. Of all the land less than 30 per cent is in the possession of the peasants, chiefly on the communal system, the remaining lands belonging to private persons, the Crown, and in the territory of the Don, to the Cossack levies. The resting-system of farming prevails in the landowners estates, while the peasants are more and more passing over to the three-field system. Field labour is done principally by oxen. Arable lands constitute, from the extraordinary rapid increase of the areas under cultivation, already about 46 per cent of the whole surface. The principal grains are spring wheat, in the Bessarabian government maize, and rye and barley. Further crops of flax and tobacco are widely spread, as in the Taurida government, and in some places, such as Bessarabia, the southern part of the Taurida government and along the lower Don, horticulture has a great importance and particularly vine growing and wine making. There is everywhere very little wood. The forests constitute only a little more than 3 per cent of the total area. After agriculture, cattle raising possesses a great importance, and is concentrated in the hands of the large landowners in thinly inhabited spots. Horse breeding is normally developed in the region, namely 23 horses per 100 inhabitants. But in respect to the breeding of cattle and sheep the Novorossisk region occupies the first place in Russia, the proportions being of the former 50 head per 100 inhabitants, and of sheep, 170. To the government of Taurida in respect to the number of all kinds of animals per inhabitant belongs the first place in the whole or European Russia. Besides other animals, in the south and east of the region the camel is also met with.

VI. The Lower Volga region includes the governments of Samara, Orenburg and Astrakhan, occupying the exceedingly varied country between the Volga and the Ural range and partly even beyond the latter. The north-eastern portion of the region, situated along the Ural, is mountainous and covered although to no great extent with forests, the remaining area affords a vast, here and there slightly undulating steppe very ill-watered plain, gradually falling to the south and lying near the Caspian 85 feet below the level of the sea. Forests occupy not more than 12 per cent of the whole region and exist only in the northern parts of the governments of Orenburg and Samara. The chernoziom in the north gradually passes to the south into other less fertile soils abounding in salt marshes, and finally in the Astrakhan government is replaced by the almost universally prevailing sands. The in general thin population, showing but an average of 470 inhabitants per square geographical mile, is least dense in the south; in the government of Astrakhan there are less than 200 inhabitants to the square geographical mile, where dwell in part nomads. The peasant communities hold 60 per cent of all the lands. The arable lands, occupying a total of only 38 per cent of the general area, in the Astrakhan government in consequence of unfavourable conditions of soil form only 9 per cent. The prevailing system of farming in the north is that of three fields, further to the south the resting system, and in the extreme south among the nomads the primitive pasturing system. The predominating plants of field culture are spring wheat, then rye and finally millet and oats. Among the lower Volga gov-

ernments, on the whole yielding considerable grain surpluses, that of Astrakhan, uses, besides its own, imported grain. Cattle raising is everywhere considerable and especially so in the south where, for example in the Astrakhan government, among the nomads it is the unique source of their wealth. As regards the development of horse breeding the region occupies the first place in European Russia, namely there are 45 horses per 100 inhabitants. But as regards other kinds of stock the region under consideration stands somewhat lower than the steppe region of Novorossisk, there being 36 head of horned cattle and 92 sheep per 100 souls. Among the branches of stock-raising a not unimportant place must be assigned to camel breeding. Industry throughout the region under consideration is feebly developed. Most importance is possessed in some parts by mining and in the lower waters of the Volga by fishing industries.

VII. The Moscow Industrial region occupies the central part of European Russia on the upper course of the Volga and its tributaries and consists of the governments of Vladimir, Moscow, Kaluga, Tver, Yaroslav, and Kostroma. It is as its name denotes that region of the country where side by side with agriculture manufacturing industry has in the life of the people a very essential significance. The Industrial governments are situated partly in a level and partly in a hilly country, furnished with an abundance of water and meadow lands, but covered in the majority of cases with a clayey, sandy here and there swampy, and on the whole little fertile soil. The poorness of the soil in conjunction with a pretty dense population, reaching in the whole region 1,700 inhabitants and in the Moscow government above 3,500 inhabitants per square geographical mile, causes a deficiency of grain for the local population and calls forth the consumption of imported grain. Forests occupy 42 per cent of the whole area of the governments and in that of Kostroma even 60 per cent. In the possession of the peasant communes are 46 per cent of the whole land. The three-field system prevails almost universally, the sowing of grasses occurring here and there, while in some few spots in the forest localities the forest system of farming is met with. Arable lands in all occupy less than 30 per cent. Crops of rye and oats predominate, next following barley and buckwheat. The cultivation of flax for fibre is almost universally spread, but more particularly in the governments of Vladimir and Yaroslav. The growing of potatoes is most considerable in the Moscow and Yaroslav governments, where they occupy from 5 per cent, in Yaroslav, to 6 per cent in Moscow, of the whole area under cultivation. Commercial kitchen gardening has in some parts a pretty considerable importance. Cattle raising is carried on in the majority of cases only for the satisfaction of local needs, manure for dressing the fields, et cetera. There are 17 horses per 100 inhabitants, and 25 head of cattle. Latterly dairy farming has in some parts attained great importance, as also cheese making. Most feebly developed of all is sheep farming; there are but 25 sheep per 100 inhabitants. Both the technical treatment of agricultural products and the very highly developed manufacturing and household industry possess almost everywhere very great importance, as the population not being guaranteed from the poverty of the soil, by agriculture, is forced to resort to various industries and subsidiary earnings. In the well-wooded government of Kostroma forest industry also possesses an essential importance.

VIII. The White Russia region consists of the governments of Moghilev, Minsk, Vitebsk and Smolensk, situated partly in a rolling, partly in a level swampy locality along the upper Dnieper and its tributary the Pripiat, along the upper and middle

Dvina and along the upper waters of the Nieman. The country is abundantly supplied with water, and in some parts there are extensive boggy areas \*. There is everywhere a sufficiency of forests, more than 37 per cent of the total area, and they are scattered pretty uniformly. The density of the population, consisting principally of White Russians, reaches 1,260 inhabitants per square geographical mile. In the possession of the peasants, principally on the household hereditary system, are 40 per cent of all the lands. In consequence of the poorness of the soil, which is clayey and sandy, there is a need for imported grain. Arable lands are distributed pretty evenly, constituting on an average about 27 per cent of the whole area. The system of farming in the majority of cases is the three-field. In the wooded localities the forest system is occasionally to be met with. Rye and oats prevail universally, next following barley or buckwheat. Flax is sown for fibre in all the governments, but in those of Vitebsk and Smolensk it occupies the greatest surface. Potatoes are sown in large quantities mainly in the west of the region. Horticulture here and there plays a small part. Cattle raising is intimately bound up with agriculture and does not possess any independent industrial significance. To every 100 inhabitants there are 21 horses, and 26 head of horned cattle. Latterly, in some places of the Smolensk and a few other governments, dairy farming and cheese making have begun to develop. Sheep farming has but a limited extension, there being 24 sheep per 100 inhabitants. Manufacturing industry is feebly developed. The technical treatment of agricultural products, on the contrary, possesses a considerable importance. In certain localities forest industries are also fairly important.

IX. The Lithuanian region, embracing the governments of Kovno, Vilno, and Grodno, is situated in the basin of the Nieman and partially in that of the Western Bug, a tributary of the Vistula, and presents a hilly, fairly wooded country (forest forms 25 per cent) scattered here and there with a number of small lakes and bogs. The soil is principally clayey and sandy, and in general little fertile. The rather dense population belonging principally to the Lithuanian race, 1,800 inhabitants per square mile, is thickest of all in the north and south of the region. Its chief occupation is everywhere agriculture. Industry mainly directed towards the treatment of agricultural products is developed only locally and even so to a rather feeble degree. In the possession of the peasants on the homestead and hereditary principle, are 43 per cent of the lands; the remainder belong chiefly to private owners. Arable lands are evenly distributed and constitute about 40 per cent of the whole area. The prevailing system of farming is the three-field. In the west, the many-field rotation of crops with the sowing of artificial grasses and roots, as the potato, is widely spread. The predominating field plants are rye, oats and barley or potatoes, whose production is everywhere pretty considerable. Flax is everywhere sown for its fibre, but the most extensive cultivation is to be met with in the government of Kovno. The region yields very considerable grain surpluses. Cattle raising is intimately connected with agriculture and the cattle are bred oftenest of all for manure. Dairy farming is rather feebly developed and only here and there possesses a comparatively great importance. Horse breeding occurs sporadically. Per 100 inhabitants there are 18 horses, 34 head of cattle and 32 sheep.

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\* See Chapter XV, on the Pollessie.

X. The Vistula region forms the westernmost borderland of European Russia and consists of ten governments, Suvalk, Lomzha, Plotsk, Siedlets, Lublin, Warsaw, Radom, Kielets, Petrokov and Kalish, situated for the most part in the basin of the Vistula and partly in the basin of the Nieman and Varta, a tributary of the Oder. In the south the country is mountainous, due to the offspurs of the Carpathians, in the northern part mostly level and in places covered with swamps. Forests form somewhat less than a fourth of the whole area. The soil is clayey and in some places fairly fertile. In density of population, mainly Poles, the Vistula region occupies the first place in European Russia, having over 3,600 inhabitants to the square geographical mile. The principal occupation of the population is agriculture, but a highly developed industry, and in the south mining works have an enormous importance for the country. Agriculture in the majority of cases yields large surpluses, being concentrated in the north on the cultivation of rye, oats, potatoes and flax, and in the south that of winter wheat and sugar beet. The systems of farming are various but in general the many field system with crops of artificial grasses and roots, namely potatoes and beet, is that which prevails. The three-field system is met with chiefly among the peasants. The technical treatment of agricultural products is very considerably developed.

XI. The Baltic region, consisting of the governments of Lithuania, Courland and Esthonia occupies the Baltic littoral and adjacent islands, and also the lower course of the Western Dvina and the western banks of the Narova and the Chudic Lake. The region presents an undulating plain, interrupted in places by hilly tracts, covered chiefly with clayey or sandy soil, more wooded in the south than in the north. The population composed mainly of the Lettish and Finnish tribes, forms 1,370 to the square geographical mile. The main occupation of its people is agriculture which has attained here exceedingly great perfection. Nevertheless the industry directed chiefly towards the treatment of agricultural products, including spirit distilling, et cetera, and in the towns towards the manufacture of other materials, in many parts of the country is highly developed and has a great importance. About 42 per cent of the total area is in the permanent enjoyment and possession, on the homestead and hereditary system, of the peasants, the remaining lands belong to private persons. Arable lands occupy 20 per cent of the area; forests, 26 per cent. The prevailing rotation of crops in the region is the many-field with crops of grasses and roots, the three-field system only being occasionally met with among the peasants. The predominating cultivated plants are rye, barley and oats, yielding considerable surpluses. Potatoes and flax are sown in considerable quantities, the former chiefly in Esthonia and the latter in Lithuania. In Esthonia the crops of potato occupy the greatest percentage of the cultivated area of all the governments of Russia. Cattle raising in the country is highly developed both in a quantitative and in a qualitative sense, and dairy farming including the production of butter and cheese, has everywhere a very essential significance. To 100 inhabitants there are 20 horses, 39 head of cattle, and 48 sheep.

XII. The Lake region, consisting of the governments of Olonets, Novgorod, St. Petersburg and Pskov, occupies the north-western part of European Russia, lying mainly in the basin of the Great Lakes and their tributaries. The western part of the region is hilly, the eastern for the most part presents a valley abounding in swamps. The country is very well watered, besides a number of rivers and lakes, through it run the chief artificial ways uniting the Caspian Sea by the Volga with the Baltic and the

White seas. The soil is chiefly clayey or sandy and little fertile. The area of the forests is very considerable, occupying 52 per cent of the whole surface. The rather thin population, on the whole area 700 inhabitants to the square geographical mile, becomes denser only in the neighbourhood of St. Petersburg. The chief occupation in most cases is agriculture, and in some parts forest industry. Manufacturing is highly developed only in St. Petersburg and its neighbourhood. In the Olonets government the greater part of the land belongs to the State, while 20 per cent of all the lands is in the possession of the peasants. In consequence of the poverty of the soil the population cannot satisfy its wants with its own grain. Arable lands form 10 per cent of the whole area, and they only reach 27 per cent in the Pskov government. The systems of farming are very varied. The three-field system prevails, in some part the forest system is met with and here and there, near St. Petersburg, even the many-field. The sowings of artificial grasses are fairly considerable. Everywhere rye, oats and barley dominate in farming, and in the government of Pskov, rye, oats and flax. This government in respect to the flax sown for fibre occupies the first place in Russia. Cattle raising has a great importance only in such places where, thanks to the convenient market, in St. Petersburg, butter churning and cheese making have developed. To 100 inhabitants there are 17 horses, 41 head of cattle and 35 sheep.

XIII. The region of the Extreme North, including the largest governments of European Russia, Vologda and Archangel, present a vast expanse, on the whole level, only in places undulating, situated in the north of European Russia, in the basins of the Northern Dvina, Mezen and Pechora and along the lower course of the Onega as far as the Arctic Ocean. The immense extent of the forests, reaching 60 per cent and in the government of Vologda 86 per cent of the total area, of the swamps, tundras and other unsuitable lands, is the cause of the excessively sparse population, a little more than 50 inhabitants to the square geographical mile, whose chief occupation to the south of the parallel of Archangel is nevertheless agriculture. To the north of this parallel the cultivation of field plants, in consequence of the severity of the climate, is perfectly impossible, and the population is employed with reindeer breeding and fishing. Along the rivers in some places constituting the sole ways of communication in summer and in winter, there are many meadows favouring the raising of cattle. In consequence of the poverty of the soil, the grain raised does not suffice even for the very sparse local population for its food and it is compelled to obtain it in more southern governments. Only 3 per cent of the whole area is in the possession of the peasant communities, in personal possession still less, while the remaining land in the region belongs to the State. The systems of farming, giving satisfactory results only beginning from the south of the government of Archangel, are various but in the majority of cases the forest and the three field systems are those prevailing. Arable lands occupy an insignificant area, namely but 1 per cent of the whole area and only in the three south-western districts of the government of Vologda is the raising of grain sufficiently developed to give a surplus. In the north, barley predominates; further south, rye and oats. In the south, rye takes the first place. The remaining plants, flax and the potato, are produced in very small quantities. Cattle raising in consequence of the abundance of meadows is rather considerable and plays a part of no small importance in the economic life of the population. Dairy farming has the greatest importance in the south-western part of the Vologda government. There are 21 horses per 100 inhabitants, 40 head of cattle and 35 sheep. A great

aid to husbandry is the forest industry, but of still greater importance are the hunting and fishing industries. Manufacture in the region is extremely feebly developed.

XIV. The Ural region, embracing the governments of Viatka, Perm and Ufa, presents a country very varied in relief intersected from north to south by the Ural mountains and situated in the basin of the Kama, its western half, and in that of the Obi, its eastern or Transural half. The soil is very varied, in the north clayey, in the south chernoziom, in the Ural rocky. Forests occupy 62 per cent of the total area. The population in which, notwithstanding the variety of its composition, the Great Russian element prevails, has a density of not more than 700 inhabitants to the square geographical mile. The predominating occupation of the population in the majority of localities is agriculture, but besides this, mining which has here received the greatest development, the technical treatment of agricultural products, and household industries have almost everywhere a very great importance. In the whole region 32 per cent of the lands belong to the peasant communities. The number of personal proprietors is very insignificant, but many of them possess immense areas. The greater part, however, of the lands belong to the State. Arable lands occupy about 18 per cent of the whole area, this proportion rising in the most agricultural of the governments Viatka, to 31 per cent, and falling in that of Perm to 10 per cent. Notwithstanding the small percentage of arable lands, throughout the region, with the exception of the mining districts, there are grain surpluses. The systems of farming are very various; the three-field system prevails, but the forest and resting systems are to be met with. The predominating cereals are rye and oats; next follows spring wheat or barley. In the Perm government oats occupies the first place in farming. In the region, spelt also is here and there sown. Of the other plants the greatest importance is possessed by the cultivation of flax, in the government of Viatka. Stock raising is fairly considerable. The greatest importance belongs to the branch of horse breeding, there being 36 horses to every 100 inhabitants. Consequently, on account of the development of its horse breeding, the Ural region occupies the second place in European Russia. The remaining branches of stock breeding are also very highly developed. Per 100 inhabitants there are 31 head of horned cattle and 45 sheep. In many localities a very great importance attaches also to forest industries.

## CHAPTER I.

## The Climate.

The radical differences in the climate of Russia as compared with other countries, and especially with North America. The influence of the climate on the propagation of cultivated plants, and on the duration of vegetation. Methods of collecting meteorological data.

**O**WING to its vast area Russia has a variety of climates. For this reason the opinion of those foreigners who imagine Russia to be a land of snow, is quite as false as the statement constantly made in Russia, that every variety of climate from the coldest to the warmest is met with. In a small area of Russia we find localities whose mean temperature corresponds to that of Central Italy and the eastern coast of Virginia, U. S. A., where most, if not all, the plants of southern Europe can be cultivated; but no tropical plants can be raised in any part of Russia. In the vast area of Asiatic Russia, we meet with a greater variety of climates than in European Russia. If we take the extreme winter temperature in the coldest valleys of North Eastern Siberia where the mean January temperature is  $-52^{\circ}$  Celsius ( $-62^{\circ}$  Fahr.), and the south of Merv, where the mean July temperature is as high as  $32^{\circ}$  Celsius ( $89.6^{\circ}$  F.), it is obvious that even the British Empire, with all its colonies and possessions, does not present such contrasts of exceedingly cold winters and hot summers. But if we take the mean temperature for the entire year, then the difference is greater in the British Empire than in Russia, as it ranges from  $-20^{\circ}$  C. ( $-4^{\circ}$  F.) on the American Archipelago, to  $28^{\circ}$  ( $82.4^{\circ}$  F.) in India; while in Russia it is not lower than  $-18^{\circ}$  C. ( $-0.4^{\circ}$  F.) in the extreme north-east of Siberia, and in the Transcaspian Territory it reaches  $17^{\circ}$  C. ( $62.6^{\circ}$  F.).

Regarding the yearly range of temperature, the immense extent of Asiatic Russia exceeds all other parts of the world. In the greater part of Siberia we find a range of more than  $50^{\circ}$  C. ( $90^{\circ}$  F.) and in the valleys of the Middle Lena and neighbouring rivers it reaches  $60^{\circ}$  ( $99^{\circ}$  F.), and even  $65^{\circ}$  C. ( $117^{\circ}$  F.). On the contrary, localities with a small yearly range, so characteristic of the tropics and of the oceanic climates of low latitudes, are not to be found in Russia. The smallest range found in European Russia occurs on the shores of the Baltic and Black seas; and only on the eastern shore of the Black Sea does it fall to  $27^{\circ}$  C. ( $64.4^{\circ}$  F.) (at Sukhoum-Kalé and Batoum), reaching as low on the Murman coast near the Norwegian frontier on the shores of those parts of the Polar Sea which do not freeze. A part of Russia lying in such high latitudes, is quite unfit for agriculture and men are attracted there only for the purpose of fishing and hunting, especially for whales, seals and other fur animals.

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On by far the greater portion of Russia, however, the climate permits of agriculture more or less advantageous. If, nevertheless, we find also in these more southern parts of Russia localities only sparsely populated with nomadic tribes of hunters, or entirely uninhabited, this condition of affairs is due to two reasons: in Siberia, it is mainly owing to its distance from European Russia and to the lack of good roadway-communications; while further south, in the great deserted steppes of Central Asia, the temperature is favourable to agriculture and horticulture, but the scarcity of rain and atmospheric moisture interferes with the settlement of the country. From time immemorial the people of these sections have artificially irrigated the land from the rivers and streams, and created rich oases in many parts of the territory, performing on a large scale the same work carried on in Arizona, New Mexico and southern California, prior to their annexation to the United States.

In Russia, owing to the continental climate, i. e., the comparatively hot summers and cold winters, of the cultivated plants the annuals prevail, as is also the case in the greater part of the United States; but plants of warm regions can also be raised, provided they do not require warmth for the entire year. In a great part of Russia not only can cotton be grown, but its culture is conducted on a larger scale in higher latitudes, than in any other parts of the world. In the United States, for instance, the classical country of cotton, it is nowhere cultivated on a large scale in a higher latitude than  $38^{\circ}$  N., and generally it hardly reaches  $37^{\circ}$  N.; while in Russia, large plantations of cotton are to be found on the Amu-Darya, in the neighbourhood of Khiva, at a latitude of  $42^{\circ}$  N. In western Europe and the countries on the Mediterranean coast, as well as in China and Japan, the cotton plant does not flourish in such high latitudes as in Russia. The cereals can also be cultivated much further north in Russia, than in any other part of the world, except Scandinavia; and there is no doubt that in Siberia they have not yet reached their most northern limit of possible cultivation, as, owing to the ignorance and scarcity of the population, hardly any efforts have as yet been made to test this question seriously. Lately successful attempts have been made in the valley of the Middle Lena river, near Yakutsk, where at the mean temperature of  $-11^{\circ}$  C. ( $12\cdot2^{\circ}$  F.) and with a soil thawing during summer only to the depth of one sajene (7 feet), not only good crops of rye and barley, but even spring wheat have been raised.

Rice, a characteristic plant of southern and eastern Asia, which requires for its ripening much moisture and warmth, is also cultivated in small quantities in Russia in fairly high latitudes, as it can be met with somewhat beyond  $42^{\circ}$  N. in the oasis of Khiva and in Transcaucasia, near the Caspian Sea. In northern Italy alone the cultivation of this plant extends farther north than in Russia, that is, to  $46^{\circ}$  N. It is quite different with perennial plants. Myrtle and laurel trees, so well adapted to the open air even in northern Ireland, do not weather the winter of the warmest parts of Russia east of the Caspian Sea, and in the entire area of Russia they can grow only on the southern coast of the Crimea and on the eastern shore of the Black Sea, south of  $44^{\circ}$  N. Vineyards yielding excellent fruit are to be met with in a large part of Russia, but they must be protected during the winter by being covered with earth, not only on the lower parts of the Volga and the Don, but also on the northern slopes of the mountains of Crimea and further south in the valley of the Terek and the oasis of Khiva ( $42^{\circ}$  N.).

Passing to a more detailed sketch of the climate, it is necessary to state that what follows relates only to European Russia, with the exception of a few remarks concerning Transcaucasia and Central Asia.

Latitude.	Meteorological stations.	Height above the sea level in metres.	Mean temperature by C.									The whole year.
			January.	March.	April.	May.	July.	Sept.	October.	Nov.		
64 $\frac{1}{2}$	Archangel . . . . .	10	-13.6	-7.4	-1.0	5.0	15.9	8.3	1.5	-5.7	0.4	
59 $\frac{1}{2}$	Vologda . . . . .	120	-11.8	-6.0	2.2	8.5	17.6	9.6	2.3	-4.0	2.2	
60	St. Petersburg . . . . .	10	-9.4	-4.6	9.1	8.8	17.8	10.8	4.5	-1.5	3.7	
56 $\frac{1}{2}$	Mitau . . . . .	10	-5.0	1.0	4.9	11.0	17.6	12.1	6.9	0.9	6.8	
58 $\frac{1}{2}$	Viatka . . . . .	177	-15.1	-6.8	0.3	9.3	18.4	8.6	1.7	-5.2	1.4	
52	Warsaw . . . . .	120	-4.5	0.4	7.0	13.1	18.6	13.4	7.8	1.5	7.2	
54 $\frac{1}{2}$	Gorki, gov. of Moghilev.	210	-8.4	-3.2	4.4	11.9	18.0	11.5	5.4	-1.2	4.8	
56	Moscow . . . . .	160	-11.0	-4.7	3.4	11.6	18.9	11.7	4.3	-2.4	3.9	
56	Kazan . . . . .	80	-14.0	-6.6	2.7	12.4	19.6	10.3	3.7	-3.3	3.0	
48 $\frac{1}{2}$	Kamenets-Podolsk . . . . .	220	-3.3	1.5	9.2	14.7	20.3	15.2	10.8	2.7	8.8	
50 $\frac{1}{2}$	Kiev . . . . .	183	-6.1	-0.9	6.9	14.0	19.3	13.7	7.4	0.7	6.3	
49 $\frac{1}{2}$	Poltava . . . . .	167	-8.2	-1.4	6.8	15.0	21.1	14.5	8.2	0.9	7.1	
51 $\frac{1}{2}$	Voronezh . . . . .	175	-9.8	-3.8	5.1	13.2	20.1	12.4	5.5	-1.6	5.1	
51 $\frac{1}{2}$	Mariinsk, gov. of Saratov.	200	-13.5	-7.0	3.4	12.4	19.0	11.9	4.9	-1.7	3.6	
54 $\frac{1}{2}$	Simbirsk . . . . .	152	-13.4	-6.1	3.4	13.6	20.4	10.7	3.6	-3.8	3.3	
54 $\frac{1}{2}$	Ufa . . . . .	170	-13.5	-7.2	2.1	13.1	20.8	10.6	3.3	-4.6	3.1	
47	Kishinev . . . . .	114	-3.4	2.8	10.0	16.1	22.4	16.3	10.9	4.1	9.9	
46 $\frac{1}{2}$	Odessa . . . . .	65	-3.6	1.5	8.2	15.0	22.6	16.5	11.2	4.9	9.6	
47 $\frac{1}{2}$	Novocherkask . . . . .	95	-6.1	-0.3	8.4	16.5	24.0	17.1	9.6	2.7	8.9	
48 $\frac{1}{2}$	Tsaritsin . . . . .	30	-11.3	-3.3	6.3	15.5	23.6	15.8	7.6	0.5	7.0	
51 $\frac{1}{2}$	Orenburg . . . . .	101	-15.3	-9.0	3.2	14.0	21.6	12.9	3.8	-3.9	3.3	
46 $\frac{1}{2}$	Astrakhan . . . . .	-20	-7.1	-0.5	9.4	17.8	25.5	17.7	10.0	3.4	9.4	
45	Simferopol . . . . .	254	-0.6	3.8	9.0	14.6	20.7	16.1	10.9	6.3	10.1	
44 $\frac{1}{2}$	Yalta . . . . .	40	4.0	6.6	11.1	16.6	24.6	19.8	14.8	10.2	13.7	
45	Stavropol . . . . .	580	-3.8	1.2	7.6	14.1	20.3	14.6	9.5	4.1	8.4	
43	Soukhoum . . . . .	5	6.1	8.8	12.8	17.1	22.6	20.2	17.2	13.1	14.7	
40 $\frac{1}{2}$	Baku . . . . .	0	3.4	6.1	11.1	17.7	25.8	21.9	16.6	11.4	14.3	
41 $\frac{1}{2}$	Petro-Alexandrovsk . . . . .	100	-5.9	8.1	15.1	22.0	29.0	20.1	10.3	3.9	12.6	
41 $\frac{1}{2}$	Tashkend . . . . .	450	-1.7	8.4	14.8	2	26.8	18.5	11.5	5.9	13.2	

The mean yearly temperature fluctuates between -2° C. (28.4° F.) in the far north-east to 15° C. (59° F.) on the south-eastern coast of the Black Sea. The temperature for January varies between -20° C. (-4° F.) on the Pechora and +4° C. (39.2° F.) on the southern coast of Crimea, for July between 4° C. (39.2° F.) on the coast of the Polar Sea opposite Nova Zembla and 26° C. (78.8° F.) in the Aralo-Caspian steppes. But the fluctuations will be much diminished if the extreme North, where agriculture hardly if at all exists, and the southern part of Crimea, where southern European garden-culture prevails, be excluded. The mean yearly temperature will then vary between 1° C. (33.8° F.) in the government of Perm, and 12° C. (53.6° F.) on the Terek, the January temperature, between -16° C. (3.2° F.) in the governments of Orenburg and Ufa, west of the Ural chain, and 0° C. (32° F.) in Crimea; the July temperature, from 16° C. (60.8° F.) in the southern parts of the governments of Archangel and Uleaborg, to 25.5° C. (77.9° F.) at Astrakhan.

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In all European Russia, as is shown by the foregoing table, the winter months have much frost, and the rivers in the vast area are ice-bound for a greater or lesser period. Concerning the freezing and opening of the rivers, observations have been made in St. Petersburg since 1709. If all the rivers were small, the duration of closing by frost would coincide with the time of winter frosts, yet it is known that large rivers are opened in the spring and, especially, are frozen much later than the smaller streams. The Volga, between the mouth of the Kama and Tsaritsin, is frozen much later than might be expected, taking into consideration the existing frosts.

The line connecting points where the water is frozen for about 180 days during the year passes somewhat south of Uleaborg and Archangel, thence to the Ural mountains, near 60° parallel of North latitude. The line of freezing for 150 days passes somewhat to the north of St. Petersburg, Yaroslav and Kazan; for 120 days, somewhat to the south of Riga (56° 30' N.) north of Kharkov and near Kamyshin on the Volga (50° N.); for 90 days, from Warsaw (52° N.) through the government of Podolia towards Kherson in the lower part of the Dnieper (46° 30' N.). In Transcaucasia the rivers on the plains do not freeze; but in Central Asia, the Amu-Darya near Khiva (42° N.) freezes for three months, and even near Chardzhoui (39° N.) it freezes for a short time, although not every year. If the length of time that rivers remain frozen is of importance to navigation, the snow-covering of the earth has a greater importance for agriculture, as it affords a protection for the winter crops, and provides moisture for the fields, and in the spring, water for the rivers.

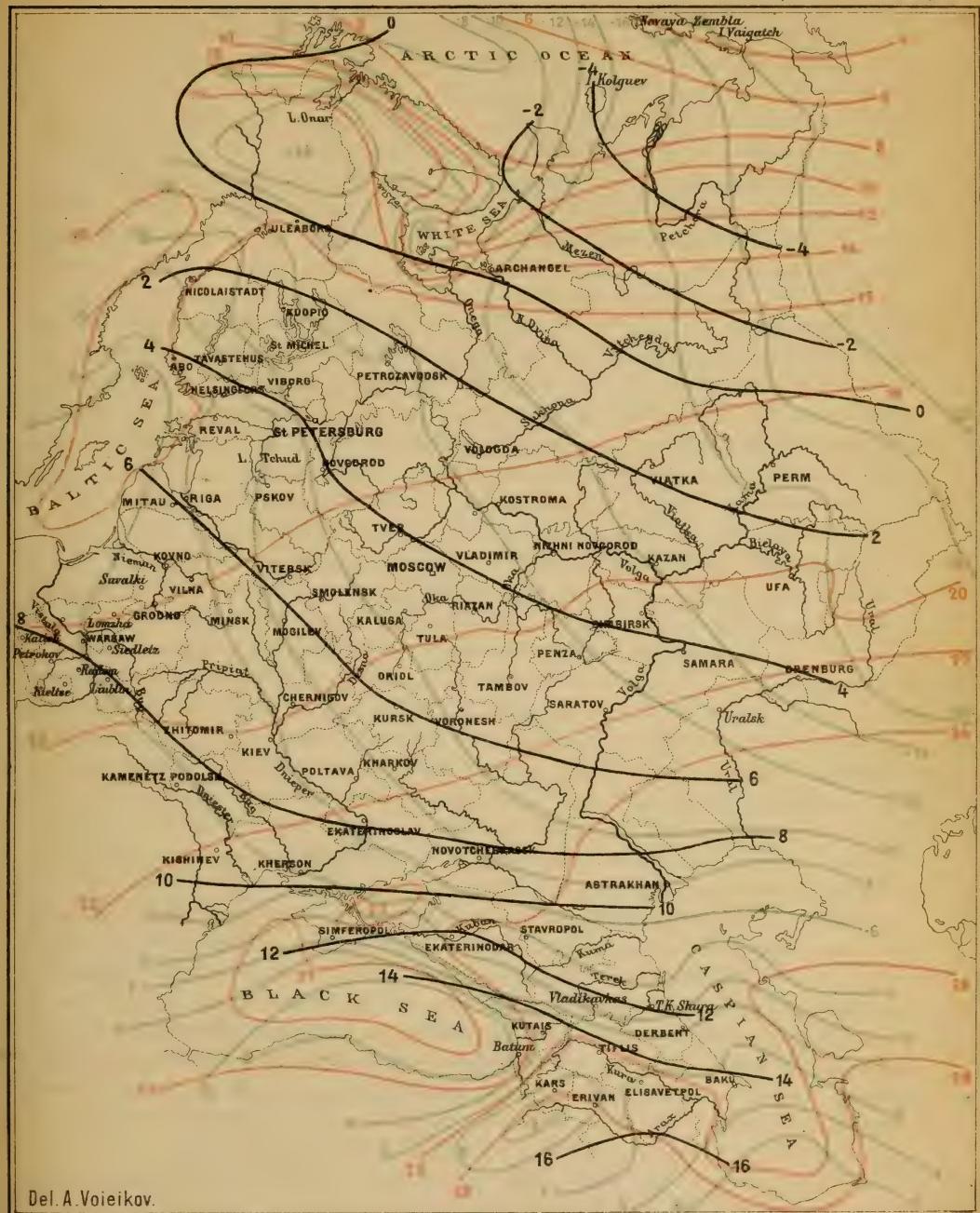
The careful study of the influence of snow-layers is of recent origin. Only in the fall of 1888 the meteorological stations of the Russian Imperial Geographical Society began to observe the depth of snow on the ground, and since 1890 the Central Physical Observatory at St. Petersburg, with the system of meteorological stations under its control, has followed their example. But the observations of four years are certainly inadequate to base any exact deductions upon this vital question. It is, however, clear that about 300 miles to the south of Moscow, beginning from the government of Kursk, the snow-layers begin to be less uniform even in the middle of winter. This fact is still more conspicuous in the south-easterly sections, where intense snowless frosts are frequent. In the western parts of Russia, the snow-layers are also less regular and disappear more quickly, but this is owing to higher winter temperatures. Snowless winters are generally warm, and conversely.

The duration of the winter period in Russia is of great importance, as during this season agriculture is impossible, and a large part of the rural population must remain idle. In the following table under letter *a* the number of days during the year having a mean temperature above zero (32 F.) is given, and under letter *b*, those with a mean temperature above 6° C. (42.8° F.). The column *a* corresponds approximately to the number of days during which field work is possible; the column *b*, to the number of days during which the growth of cereals, such as rye and barley, is possible:

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## CLIMATOLOGICAL MAP.

Chapter I. Climate. Map No. 1.



Del. A. Voieikov.

Cartographical works A.Jlyne S.P.B.

— Isothermal lines of the year.

January

— Isothermal lines.

July



	<i>a</i>	<i>b</i>		<i>a</i>	<i>b</i>
Archangel . . . . .	185	125	Yalta . . . . .	365	285
Vologda. . . . .	200	150	Ufa. . . . .	205	160
St-Petersburg . . . . .	215	155	Kishinev . . . . .	285	225
Mitau . . . . .	245	180	Odessa . . . . .	285	225
Warsaw. . . . .	255	195	Lougansk. . . . .	245	200
Gorki. . . . .	225	170	Saratov. . . . .	220	180
Moscow. . . . .	220	165	Orenburg. . . . .	210	170
Viatka . . . . .	200	150	Astrakhan. . . . .	260	210
Kamenets-Podolsk . . . . .	265	215	Stavropol. . . . .	280	210
Kiev . . . . .	240	200	Poti . . . . .	365	330
Voronezh . . . . .	225	180	Baku . . . . .	365	285
Simbirsk . . . . .	210	165			

The following table indicates the time of harvest and the period of growth of the main cereals; for winter crops the winter time is also included. This table is based on the statistics of the Department of Agriculture and of Rural Economy. In examining the table it is clearly seen that the time of growth of winter crops increases in the direction from south-west to north-east, which is owing to the fact that the same is also true of the duration of winter. The time required for the growth of winter crops, therefore, depends more on the prolonged condition of rest under the snow, than on slow-growing. On the contrary the growth period of spring crops decreases from west to east (for oats, in the governments of the Vistula basin 126 days; Kherson 123 days; in Samara and Simbirsk, only 97 days). This is easily explained by the fact that the more eastward, the more continental is the climate, i. e., the summers are hotter and dryer.

The table on page 7 gives an idea of the precipitation of moisture in different localities in Russia for the entire year and for the five summer months. The annual rain-fall in European Russia, excepting the most rainy localities of the Caucasus, fluctuates between 5·9 inches and a trifle over 23·6. The least quantity of rain is met with in the Aralo-Caspian steppes, where the summers are exceedingly hot, and the air very dry, so that agriculture is impossible without artificial irrigation. A yearly quantity somewhat less than 11·5 inches falls also in the southern districts of the governments of Samara and Saratov, in the steppes south of the river Don and in the northern parts of Crimea. In these sections, although no artificial irrigation is resorted to, the crops are often very uncertain and frequently fail from droughts.

In all the remainder of European Russia the yearly rain-fall ranges from 11·5 inches to 25·5 inches. Next to the south and south-east sections, the minimum of rainfall is met with in the north, where notwithstanding this fact, droughts are rare and the harvests often suffer from an overabundance of moisture. This is owing to the fact that at the low existing temperature, a much smaller quantity of moisture is sufficient for the slower evaporation. Besides this, the long winters, and the presence of large lakes, swamps and forests, favour the existence of a greater quantity of moisture. The central black-earth governments of Russia suffer more frequently from droughts than the northern governments, although in the former the precipitation of moisture is much more copious. The fact is that in the direction from north to south the need of water in European Russia increases faster than the amount of the rain-fall. Towards the south from 50° N. in western Russia, and from 54° N. in eastern Russia, the amount of rain begins

Names of governments and localities.	W i n t e r C e r e a l s.		S p r i n g C e r e a l s.		W h e a t.		O a t s.	
	R y e.	Mean harvest-time New style. Days of growth.						
Govt. of Archangel . . . . .	August 22	375	—	—	—	August 27	—	—
» Vologda (southern part).	» 22	372	—	—	—	100	August 27	—
» Courland . . . . .	» 1	333	August 11	335	—	—	27	103
Govt. of Poland . . . . .	July 27	309	» 6	319	—	—	19	108
Govt. of Minsk . . . . .	» 27	325	» 6	335	—	—	17	126
Pskov . . . . .	August 1	345	» 6	—	—	—	—	112
» Moscow (N. part) . . . . .	» 6	350	—	—	—	—	—	103
» Kostroma . . . . .	» 11	357	—	—	—	—	—	93
Viatka . . . . .	» 13	359	—	—	—	—	—	103
» Volynia (S. part) . . . . .	July 27	325	August 1	325	—	—	—	98
» Polotia . . . . .	» 22	320	July 27	325	—	—	—	103
» Poltava . . . . .	» 17	320	» 27	330	August 1	111	—	6
» Voronezh . . . . .	» 22	330	» 27	335	» 6	107	—	99
» Kursk (N. part) . . . . .	» 27	332	» 30	338	—	—	—	123
Tula (S. part) . . . . .	August 1	340	August 6	342	—	—	—	11
Riazan . . . . .	July 27	338	—	—	—	—	—	121
Penza . . . . .	» 27	344	—	—	—	—	—	111
» Simbirsk (N. part) . . . . .	» 27	344	—	—	—	—	—	107
Ufa . . . . .	August 1	350	—	—	—	—	—	102
Bessarabia . . . . .	July 22	304	July 27	309	» 1	111	July 22	107
Kherson (S. part) . . . . .	» 13	290	» 27	304	» 1	123	August 1	118
Taurida (N. part) . . . . .	August 6	284	» 17	315	July 27	123	July 27	123
Ekatерinoslav . . . . .	July 13	311	» 17	315	August 1	118	August 6	123
Samara (S. part) . . . . .	—	—	—	—	» 13	99	—	97
Territory of Kuban . . . . .	June 27	283	» 17	293	July 22	113	July 22	101
» Don . . . . .	—	—	—	—	» 22	107	August 1	101

to show a decrease; and as in the same direction rises the temperature and the number of clear days, hence the further to the South, the oftener droughts are met.

T A B L E.  
Rainfall in Inches.

Localities.	Entire year.	From May to Sept.	Localities.	Entire year.	From May to Sept.
Kem . . . . .	14·1	8·7	Ufa . . . . .	16·6	10·9
Archangel . . . . .	15·6	8·5	Kishinev . . . . .	18·5	10·9
St-Petersburg . . . . .	18·5	10·6	Odessa and Nikolayef . . . . .	15·7	8·1
Mitau . . . . .	20·1	11·9	Poltava and Kharkov . . . . .	21·2	11·0
Warsaw . . . . .	22·3	12·2	Lougansk (government of Eka-		
Radom . . . . .	27·0	15·5	terinoslav . . . . .	14·6	8·3
Vilna . . . . .	22·1	12·5	Novotcherkask . . . . .	17·5	9·0
Gorki . . . . .	20·5	11·0	Saratov . . . . .	17·6	8·3
Moscow . . . . .	21·1	11·5	Uralsk . . . . .	12·6	5·7
Kostroma . . . . .	20·2	12·1	Orenburg . . . . .	15·5	8·0
Vologda . . . . .	18·6	10·6	Astrakhan . . . . .	6·1	3·0
Viatka . . . . .	17·3	10·6	Simferopol . . . . .	18·9	9·2
Perm . . . . .	19·5	10·5	Yalta . . . . .	18·2	6·1
Nizhni-Novgorod . . . . .	21·6	11·6	Stavropol . . . . .	29·8	15·6
Ekaterinburg } Ural . . . . .	14·0	11·2	Vladikaukaz . . . . .	34·2	23·2
Zlatoust } Ural . . . . .	18·5	12·9	Sotchi { Coast of Black-Sea . . . . .	81·4	32·1
Kiev . . . . .	20·5	11·1	Poti { Caucasus . . . . .	65·6	33·1
Chernigov . . . . .	18·0	10·6	Tiflis . . . . .	19·2	11·4
Oriol and Kursk . . . . .	21·2	11·6	Baku . . . . .	10·1	1·9
Tambov and Penza . . . . .	20·5	10·5	Petro-Alexandrovsk (lower parts of Amu-Darya) . . . . .	2·5	0·3
Simbirsk . . . . .	16·0	10·0	Tashkend . . . . .	13·0	1·1
Samara . . . . .	16·1	9·1			

A very important fact must not be overlooked, viz., that the rain-fall during the warm months of the year in different parts of Russia is not of the same character. The further to the north and west, the more frequent are protracted rains and murky weather, and the further south and east the more frequently prevail short thunder showers of comparatively small area.

Regarding the season during which the greatest amount of rain falls, we find it to be, in almost all European Russia, in summer, but not during the same month. North of  $60^{\circ}$  N. the most rain falls during August; in central Russia, north of  $50^{\circ}$  N. in the west and  $53^{\circ}$  N. lat. in the east, during July; and in the south, as far as the Black Sea and bordering mountains of the Caucasus, during June. On a small portion of the coast of the Baltic Sea a greater precipitation of moisture occurs in autumn than in summer; the same phenomenon is noticed, in a greater degree still, in the southern part of the Crimea. The mean quantity of rain per diem in summer is greatest in the district near the Carpathian Mountains, a section noted for its rain, and decreases towards the north and especially towards the south and south-east. The minimum quantity of rain per diem is met with in the Aralo-Caspian steppes, where the overheated soil and the warm dry air are unfavourable to rain-fall; there the rain drops often evaporate before they reach the ground.

With regard to the direction of winds, European Russia may be divided into two regions: of the prevailing south-western winds and of the prevailing eastern winds. The first embracing northern and the greater part of Middle Russia, belongs to the same wind-region as Western and Central Europe. Here the winds generally depend on the low air-pressure of Northern Europe, and therefore, warm and damp winds predominate, especially during the cold months of the year. In summer, western winds prevail; in winter, south-western winds are more frequent; hence, in summer the winds are comparatively cool, but nevertheless damp. In the south of Russia, between 49° and 52° N. in the autumn, winter and spring, eastern winds prevail, which bring dry air from the continent, cold from November to March, warm for the remaining months. Southern Russia, owing to its remoteness, is not under the influence of the lower pressure of Northern Europe.

The winds of this part of Russia are mostly influenced by the comparatively low pressure of the Black Sea, and by the comparatively high pressure of Central Russia and western Siberia. In summer, or to be more exact, from the middle of May to mid August the western and north-western winds prevail in southern Russia, due to the comparatively high pressure of Western Europe and to the low pressure of the Kirghiz steppes; consequently, at this season of the year the winds are laden with moisture.

In the Aralo-Caspian steppes and, more especially, in the Kirghiz steppes and on the plains of Turkestan, during the eight colder months the north-east winds prevail; and during the warmer months, north, north-west and north-east winds predominate. In all the seasons the dry winds as a consequence prevail, and this explains the small amount of rain on these steppes.

In the following table are given some examples of observations on the winds with percentages. They show that from north to south and especially in the direction of south-east the number of east and north-east winds constantly increases, and of west winds, decreases; so that in the extreme south even during summer the western winds are rarely observed.

#### T A B L E.

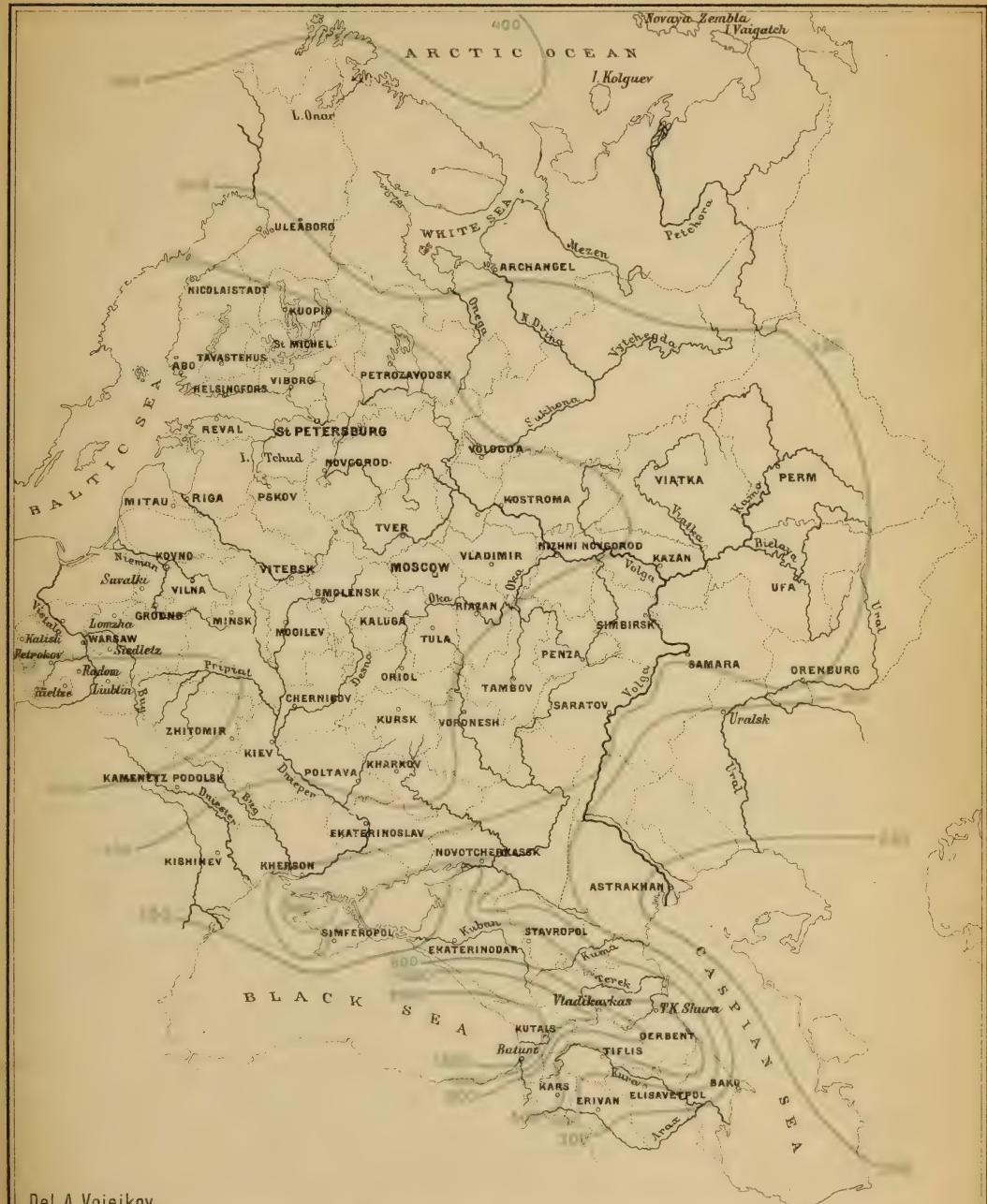
	W i n t e r.								S u m m e r.							
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Govts. of Vologda and Kostroma . .	6	3	6	15	19	25	16	11	12	11	7	7	9	19	18	17
Moscow, Vladimir .	12	6	8	11	17	15	19	12	15	8	8	9	11	15	20	14
Oriol, Kursk . . .	5	10	8	27	8	17	9	16	8	12	6	16	6	21	10	21
Kharkov, Poltava, Volchansk . . .	5	12	22	8	9	14	18	12	8	10	15	7	6	15	24	15
Lougansk and lower parts of the Don.	8	14	24	9	9	11	19	6	10	11	19	7	8	9	24	12
Astrakhan . . . .	4	24	21	17	3	7	8	16	5	19	10	23*	6	13	9	15
Lower parts of Amu- Darya . . . .	15	32	17	12	5	5	8	6	30	29	7	6	2	3	8	15

\* Sea breeze.

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# MAP OF ATMOSPHERIC PRECIPITATION.

Chapter I. Climate, Map №2.



Del. A. Voieikov.

Annual atmospheric precipitation in millimeters.

Cartographical works A.Jlyne S.P.B.



Consequently although the western winds predominate during the summer in the south of Russia, there are also frequent eastern winds. The latter are warm and dry in summer and very detrimental to general vegetation. In the more northern parts of Russia, during summer western winds also prevail, and eastern winds are rare.

In the part of Russia of the so-called black-earth region observation shows that two-thirds of the sky is covered with clouds; however, this may not be so unfavourable for vegetation as might at first be supposed. The most cloudy months during the winter are from November to January. The great cloudiness of these months is even favourable, as it protects the soil from cooling. During the months most important for vegetation, clouds cover about half the sky. Further south the cloudiness decreases and the difference between the north and south of Russia is especially noticeable from June to October. To the south-east, in Astrakhan, even November is a fairly clear month. In Turkestan, in the mean for the year, only one-third of the sky is clouded. In summer clouds hardly exist, and in winter only half the sky is covered. The clearness of the skies in summer in this region is favourable to agriculture only where artificial irrigation is possible, as otherwise, it contributes to the parching of vegetation and to the evaporation of moisture from the soil.

Observations on the duration of sunlight have been so lately begun that they do not as yet afford reliable data. Until the year 1891 they were made difficult for lack of a practicable and sensitive instrument. The heliograph of Mr. Velitchko, exhibited in the Russian section of the World's Columbian Exposition, at Chicago, fills this deficiency. Brief and not sufficiently exact also are the observations on the heat-rays of the sun; it is unquestioned, however, that in consequence of a clearer air the sun gives greater heat in the south and east of Russia than in the north and west, and this fact influences the duration of the time of growth and the ripening of the crops; in the east they require a less amount of heat than in the west. It is hardly possible to doubt that this is due to the fact that the sun is less obscured by clouds during the period of vegetation, and the sun's radiation is more intense.

As yet, there has not been gathered a sufficient number of practical observations to explain the influence of climatic factors on agriculture. The years of very bad harvests have furnished the good result of attracting general attention to agricultural meteorology, and it may be hoped that the work recently commenced will receive greater development and that meteorological investigations may soon be utilized in bringing about a more practical agriculture. Up to an extremely recent date in Russia, as well as in the United States and other countries, meteorologists did not pay sufficient attention to phenomena vitally important to agriculture. Most of the present observations have been made in cities and, it is obvious how different is the temperature, and the humidity and clearness of the atmosphere in cities, than in the open country. Serious attention has been attracted only recently, as has been here stated, to the snow-coverings, which are of such great importance to Russia.

The number of meteorological stations in Russia increases very fast, as is shown by the data here given. The most extensive meteorological system, that of the Central Physical Observatory, liberally endowed by the Government, had the following number of stations in the years indicated:

	1881.	1891.
Second class stations * . . . . .	185	335
Stations for measuring rain-fall . . .	252	712
»    » observing thunder storms . . .	523	958

The Meteorological System of the Imperial Russian Geographical Society numbers 40 Stations devoted to purely agricultural and phenological observations, and 130 Stations devoted to investigating the thickness of snow on the ground.

The Livonian Economical Society has in the governments of Livland and Estland about 100 stations for rain-fall. The system of meteorological stations in south-western Russia, existing only since 1886, of which the observatory attached to the Novorossiysk University at Odessa forms the centre, had in 1892 the following stations, located principally in the governments of Bessarabia, Kherson and Taurida:

Stations for measuring rain-fall . . . . .	278
»    » observing thunder storms . . . . .	378
»    »    » the thickness of snow layers . . . .	262

Besides these data, periodical communications relating to the meteorological conditions of the growth of cultivated plants were forwarded to the Department of Agriculture and Rural Industry from regular correspondents at more than 4000 places, and to the Novorossiysk University from over 1600 observers.

After having examined the principal meteorological questions it is necessary to give a short sketch of the climatic conditions of different localities, as they influence one or the other system of agriculture in Russia. In the south-western part of the basin of the northern Dvina, near Vologda, we meet a locality in which, during recent times, great progress has been made in the raising of milch cattle and the culture of flax for fibre, and partly for seed. The wild and cultivated meadows give good crops even much further north; the celebrated Kholmogory race of milch cattle has its origin in lat. 64° N. and even further north in the valleys near the Arctic Ocean, under 68° and 69° N. lat. good pastures and meadows are found.

Climatic conditions favouring the development of grasses in the short summer are to be met with in Russia, not only in the far north, but also in the extreme south on high mountains and in this respect Russia can be envied even by the celebrated Alpine mountain pastures. From Crimea through the Great and Little Caucasus up to Thian-Shan, Alay and Pamir, the southern localities of the Empire are rich with mountain pastures often covered with luxuriant vegetation which, in the near future, will give large and profitable results in the raising of cattle. In the southern districts of the government of Vologda spring wheat ripens well; but hay and flax-raising being more profitable, receive greater attention.

The governments of Pskov and Kostroma are especially favourable to the cultivation of flax for fibre; further east lies the government of Viatka which, when crops are good, exports a considerable quantity of rye, oats and buckwheat. The summer here is somewhat warmer than in the west, and perhaps this fact has some influence on the cul-

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\* At the second class stations observations are made thrice a day on temperature, air-pressure, precipitation of moisture and direction of the wind.

tivation of these cereals. In any case, this is the most northerly region of Russia that has an excess of grain, as further west other products are exported, and east of the Ural mountains, in the same latitudes, agriculture hardly exists.

In the western part of European Russia, outside of the black-earth region, the climate is sufficiently favourable for the cultivation of cereals, and the somewhat cool and moist summer also favours the cultivation of hay and potatoes, the latter being cultivated to a great extent. In Poland the climate is not only warmer, but more moderate than in all the other localities we have thus far mentioned. It is a transition from the climate of Central Europe to that of central Russia, being more similar to the former than to the latter. Different as are the conditions of the climate of Poland, as compared with those of the governments lying to the north and north-east, they do not affect very much the species of plants under cultivation. This is partly due to the fact that the temperature and moisture of the summer do not differ essentially, so that in Poland food-grasses, such as clover and timothy, which require a moderate summer temperature and constant moisture, grow well, as also flax and other plants. The influence of a more moderate climate is shown by the greater time possible for field-work and the shorter duration of the snow-covering. Here exists a culture of great importance for these regions, not to be found to the north and north-east namely that of the sugar beet.

The locality along the river Pripet, the main right-feeder of the Dnieper, presents quite different conditions. Here, at a recent date, were millions of acres of marsh land, and only a little extent of fields on the hillocks amongst these swamps. In 1874 the Government began the drying and draining of this region on a large scale, in consequence of which many localities formerly unfit for agriculture are now made available for the growth of grass and cereals.

The study of the climates of the black-earth region of European Russia presents a greater interest from an agricultural point of view, this vast region having such an enormous surplus of breadstuffs, that it can be considered the granary of Europe. This is due more to the richness of its soil, than to climatic conditions. A comparison of the climate of the Russian black-earth region with that of the prairie region of the United States, the competitor of Russia in the world's grain-market, is highly interesting. If the period of vegetation be considered, a striking similarity in the climate of both these countries may be found. If the American black-earth region, by its temperature, resembles very much that of Russia, the same does not hold true in reference to snow and rain which is much greater in America, over a great area registering from thirty-one to forty inches yearly. Such conditions are not in favour of Russia, all the more so since in black-earth regions the rain-falls are extremely variable. The average of the Russian grain-growing regions is sufficient; but frequently it falls much below the average, and bad harvests are the consequence. The difference regarding vegetation, however, is not so marked as may appear at first sight, as in the American prairies stronger winds prevail, and consequently, a greater evaporation must take place at the same temperature and air moisture, as compared with Russia; on the other hand, the American prairies are often visited by severe rain storms which result in more harm than good to the crops. However, in the Russian black-earth region, the further south and south-east, the more frequently we meet with strong drying winds.

The extensive black-earth region, together with a small section of prairie or

steppe land lying to the south, must necessarily have a very varied climate, but for the practical requirements of agriculture, these differences are not as great as might at first be supposed; especially the variations of temperature have here a comparatively small influence, as the crops mainly cultivated in this region need but a short time for their growth; the existing warmth is, therefore, sufficient. Far more important is another factor, namely the distribution of moisture, and especially that of snow and rain-fall. In the irregularity of this lies the weak point of this granary of Europe. If their mean quantity is sufficient, and it is not in every part, we must consider that they are not equally divided over different months and years. Besides, the mean distribution for the season is not quite favourable for agriculture, and the farmers complain of the small quantity of rain-fall during May, August and September. Considerably prolonged periods of drought, at the end of spring, are especially dangerous to the spring crops, and a dry season at the end of the summer and during the early fall exerts a baneful influence on the winter grains. The beginning and middle of summer are more rainy, but at such time, the distribution of rain-fall is very irregular, as narrow belts of rain and thunder clouds occur, giving an excess of rain to one place and none whatever to the immediate vicinity.

In general, in the black-earth regions, as well as in other parts of the plains of Russia, the winter temperature rapidly declines from west to east; this decrease is so rapid that north of  $50^{\circ}$  the temperature sinks more quickly from west to east than from north to south. In general, the slow decline of temperature from south to north appears to be characteristic of the plains of European Russia, thus making a sharp contrast in climate to the eastern and central parts of North America. Nowhere in middle latitudes does the temperature decline so slowly with the latitude, as in Russia and nowhere so rapidly, as in the United States. The most southern part of the region under consideration differs in this respect from the rest of the Russian plains, as from  $50^{\circ}$  N. to the Black Sea the temperature increases more rapidly.

In examining some special localities of our most fertile region, we find that the most favoured, as regards climatic conditions, is the southern part of the government of Volynia with the adjacent parts of the governments of Podolia. It enjoys a milder and a more even climate than the other parts of this section. Spring begins earlier, and the fall lasts long enough to enable the agriculturist thoroughly to attend to the ploughing of his fields. The summer also is not too hot. More snow and rain fall than in any other part of the black-earth region, excepting a few localities in northern Caucasus. Its quantity varies less from year to year than is found further south and east. The climate of this locality approaches very nearly to that of southern Michigan in temperature as well as yearly distribution of the same; but the precipitation of moisture is considerably less. This region favours the cultivation of most of the cereals; especially good crops of winter wheat and oats are raised, also feeding-grasses and fruit-gardens flourish.

To the south-east of this greatly favoured region, in the greater part of the government of Kiev, and in the eastern portion of the government of Podolia, the summer is somewhat warmer than in Volynia, snow and rain-falls are more irregular and less frequent, and severe droughts are sometimes experienced. In the distribution of temperature this locality resembles the northern parts of Indiana and Ohio. The principal cereals are the same as in Volynia; winter wheat prevails even more, although

the crops are not always successful, and have been lately often destroyed by frost. Indian corn is grown however, in comparatively small quantities. This country is renowned for its beet-culture. The climate, together with other favourable conditions, undoubtedly exerts here a very great influence on the cultivation of this important crop. There is an abundance of snow and rain-fall, and the dry, warm autumn highly favours the ripening and harvesting of the beet. There are, however, also some drawbacks: the heat and drought, which occur in May, favour the propagation of the beet-bug and other insects, which often cause great destruction.

The northern and central parts of Bessarabia and that part of the government of Podolia bordering on the river Dniester, have a warmer climate than the above-mentioned regions, especially in the protected parts of the valley of the Dniester. In temperature they resemble the central parts of Ohio and Indiana, but its variations of temperature are smaller, as nothing like the American cold waves occur here. This is, indisputably, the country of Indian corn and along the Dniester and in the central parts of Bessarabia it is a land of vineyards; the grape vines find here very favourable conditions for existence during eight months of the year, but in winter they must be buried under ground.

To the east of the Dnieper, in the region consisting of the southern part of the government of Tchernigov, almost all of Poltava, the western parts of the government of Kharkov and the southern districts of Kursk, the winter temperature declines very considerably towards the east, while from north to south the difference in temperature is not very marked; of course, in the same direction decreases the period of plant-growth and, especially that of field work. In temperature these localities resemble southern Wisconsin and northern Iowa; and again, we note here slower variations in temperature and a smaller rain-fall than in America. This locality from its climatic conditions and agriculture must be considered as a transition from southern to northern regions and in many respects resembles the climate of the government of Kiev. Here also are cultivated large crops of winter wheat, as the influence of the colder winter is diminished by the more regular and deeper snow-falls. In this respect, this locality differs considerably from northern Iowa, where the cultivation of winter wheat is already considered hazardous.

The northern part of the government of Kursk, the greater parts of Tula and Oriol, the southern parts of Riazan, the western part of Tambov and the northern part of Voronezh, can be considered the centre of the black-earth region of Russia. The winters are very severe in these governments, especially in the east, but at the same time, the snow-falls are more regular and deeper. These regions have about the same temperature as the central portion of Wisconsin and the sources of the Mississippi. St. Paul, Minnesota, and Tambov, Russia, have an almost equal yearly, summer and winter temperature, but the American regions have a greater precipitation of moisture; although it is to be remarked that the difference in this respect between the United States and Russia, for these localities, is less striking than that which occurs when comparing more southerly regions. This central black-earth region is the paradise of rye and oats, which are exported hence, in large quantities, to the Moscow industrial districts and to foreign parts; however, winter wheat is here successfully cultivated. The beet-sugar culture reaches in this region its most northerly limit at 54°, in the government of Tula. Nowhere else in the world has this limit as yet been surpassed.

The next region under examination extends to the Middle Volga, stretching as far as the mouth of the river Kama and the city of Volsk, a little to the north of Saratov. The winters become gradually colder towards the east, the mean temperature of January reaches — 15° C. (5° F.) in the governments of Kazan and Simbirsk, but the summer temperature is about the same. At this season, especially during the hottest part of summer a considerable difference of temperature exists between the shores of the Volga, which here is a trifle higher than the ocean level, and the highlands near the sources of the rivers, Sura, Sviyaga and Khoper. These highlands have an elevation in some places of 800 to 1000 feet above the sea. At such heights, especially where forests still exist, the difference in climate is large and exceedingly influences the growing of cereals and fruit. Rye predominates among the winter-crops, winter wheat being sown very sparingly. In some parts of this region, especially in the east, the predominant crops are millet and spring wheat.

On the banks of the Volga we find the most easternly fruit orchards, large and profitable, of almost exclusively apple trees, the apples of Simbirsk, Khvalynsk and Volsk being especially celebrated. In the region extending from the Volga eastward to the base of the Ural mountains, the winters become more severe and, compared with America, the temperature of the valley of the Kama corresponds to that of the Red River valley, between Breckenridge and the frontiers of Manitoba, and also to that of the valley of the Missouri in northern Dakota. Besides the Ural mountains, where agriculture hardly exists, there are plateaus over 1,500 ft. high, which must exert an influence on the climate, especially on the temperature of the summer months. Such is the elevated plateau of Belebey, between Samara and Ufa, which is traversed by the great railroad uniting European Russia with Siberia. Crops are often killed here by frost before they have time to ripen. Regarding the influence these heights exert on the winters, we note that it does not so much consist in the lowering of temperature, as in the fact that a greater quantity of snow falls, and it remains until a later period of the spring. A still greater influence is exerted on the precipitation of moisture by the outlying mountains of the Ural chain. Great masses of snow accumulate on their western slopes, and feed the many springs and rivulets and the luxurions grasses and forests for which this region is famous.

It remains to examine the true steppe regions that extend to the Aralo-Caspian deserts, the Caucasus, the Crimean mountains and the Black Sea. Notwithstanding the great extent and the variations of climate between the north-eastern and south-western portions of this territory, we find much sameness in the mode of agriculture. The Caucasus excepted, this region may be divided into a western and an eastern part by a line drawn from the basin of the Don northwards.

The eastern part of this territory has a much more severe climate than the western; and in the extreme east, in the cities of Uralsk and Orenburg we meet with such a great annual range of temperature, that nothing of the like is to be found in the United States. This locality resembles more nearly the north Red River district, but the latter has colder summers than Orenburg. In addition to the great yearly range, that part of this locality, especially to the east of the Volga, presents greater variations of temperature, greater dryness during the warm months of the year, and a lesser and more irregular distribution of snow and rain. Although the winters are very severe, the lack

of snow here is not an exception but a rule; so much so that the Kirghiz who formerly roamed here, could find pasture for their cattle during the entire winter.

It is to be understood, that in such a locality good harvests are not at all regular, but depend upon the timely rains, which occur in such narrow belts, as the following proverb of the people shows: "Not the earth, but the skies produce the harvests". In spite of the capriciousness of the climate, many agriculturists were attracted to this region by its virgin and fertile soil, which yields the very best and hardest kernelled kinds of wheat. The climate also here exerts a great influence on the growth of this kind of wheat, which flourishes best where the summer temperature is sufficiently high, and little moisture prevails. The warm and dry summers of this region are very favourable to the culture of water-melons, which grow in all the steppe regions, but especially here. The melons of Kamyshin are renowned throughout Russia; they are, however, not raised on the right bank of the Volga where the city is situated, but on the left bank. The south-western part of the steppe region, in many respects, presents more favourable conditions than that of the north-eastern portion, as in a more moderate and warmer climate it is possible to pursue a greater variety of agriculture and better cattle-raising; especially that of merino sheep plays here a predominant part. Short winters require a lesser amount of fodder for animals. Here the climate is very varied. In the more northern parts, in the steppe localities of the government of Voronezh, the conditions of temperature correspond to those of the south-western part of Iowa; on the lower tracts of the Don the temperature is very similar to that of south-western Nebraska; and the warmest part of this region, the steppes of Crimea, have approximately the same temperature as southern Ohio or eastern Pennsylvania; the extreme south-west near the mouths of the Danube, is similar to that of the vicinity of New York, but the rain-fall is everywhere less than in the corresponding regions of the United States. The minimum rain-fall we find in the Kuma-Manych lowlands, south of the river Don, and in the north-western part of the Crimea; it is less than 300 mm. during the year, and the droughts are very long-continued. The maximum is in the northern part of the government of Kherson and on the northern shores of the Sea of Azov, about 450 mm.; the most rainy month is June, except in the Crimea. Vegetation begins early; very little snow is met with on the fields, because little falls during the winter, and also because the winds drive it from the fields. April and May are, generally, very dry, and during these months strong, dry winds occur.

In this region spring crops, especially wheat, prevail; the climatic conditions favourable to the growth of hard-kernelled wheat, are the same as in the north-eastern part of the steppe region; here, however, the period of vegetation commences earlier, and also the harvest is ready somewhat sooner. Winter crops are more important here than in the north-eastern part of the steppe region, and the further we proceed to the south and west, the greater are the extent of the winter crops, the winter being so mild that, although snowless, the crops generally do not freeze out. These regions resemble the more southerly portions of the American prairies, such as Kansas, where, despite the lack of snow-layers, winter wheat is one of the most important crops. Of the hay-crops those flourish which do not require a large quantity of moisture in the upper soil strata, such as alfalfa and esparcette. Frequent droughts and the ravages of beetles and the Hessian fly have forced the farmers of this region to increase their fields of barley, as barley thrives here extremely well. It is interesting to note

that the climatic conditions favour the cultivation of barley in the south of Russia, between the  $46^{\circ}$  and  $48^{\circ}$  N. lat. and also in the north, between  $63^{\circ}$  and  $65^{\circ}$  N. lat., the reason being the short time required for the maturity of the grain. In the north, owing to the fact that it has time to ripen before the first frosts, and in the south, owing to the short time required for its growth, it demands less moisture from the soil, than any other cereal. Viticulture has found favourable conditions and has been developed in three localities: 1. in southern and middle Bessarabia and in the south-western districts of the government of Kherson; 2. in the Crimea and the northern districts of the government of Taurida; 3. on the Lower Don.

The hills and valleys of northern Caucasus, from the Kuma-Manych lowlands to the base of the Caucasian mountains, were rapidly peopled during recent years, and grain from these localities is now exported in enormous quantities. The climatic conditions of this region are exceedingly varied, not so much in its temperature as in the precipitation of moisture, for the increase of the former towards the south is checked by the increasing altitude. The northernly portions of this region have very little rain-fall, which, however, gradually increases from 17 inches to 20 inches in the middle basin of the Kuban and Terek, to 28 inches on the highlands of Stavropol and to 31 inches in the valleys at the base of the mountains. The warm climate and ample rains occurring towards the end of spring and during early summer highly favour the growth of Indian corn, which here is largely cultivated. In temperature as well as in abundance of rain-fall, this region resembles central Illinois and northern Missouri.

The climatic conditions of a region like Transcaucasia, which is traversed by mountains in many directions and which borders upon two seas, are extremely varied. In the west we meet first with the coast region of the eastern part of the Black Sea; its north-western portions have not only a colder, but also a drier climate than the south-eastern. It is impossible to draw a clear line of division, but beginning at Touapse, under the  $44^{\circ}$  N. lat., the climate begins to be very humid, and rain falls very copiously; so that in two places, Sochi and Batoum, the yearly rain-fall exceeds 80 inches, being greater than in the most rainy regions of the Southern States. As, at the same time, in the southern part of this tract the climate is extremely warm, a mean yearly temperature of  $15^{\circ}$  C. ( $59^{\circ}$  F.), and  $6^{\circ}$  C. ( $42.8^{\circ}$  F.) in January, it is then easy to understand that these conditions are very favourable to a luxuriant vegetation, both wild and cultivated. The warm and humid climate exists not alone on this coast-line, but extends to the plains of the lower parts of the river Rion and the foot-hills. A great part of this region is covered with majestic forests; the tall trees are interlaced with vines, ivy and other creeping plants; here in ancient Colchis, is probably the original home of the grape vine. Nature in the region of the Caucasus bordering on the Black Sea, is too mighty for man to overcome, but no doubt in time, this section will become the pearl in the Russian Crown. Nowhere, in the Old World, outside the tropics with the exception of the southern shores of the Caspian Sea, is there anything to equal it. On the shores of the Mediterranean, in Greece, Italy and Spain, the summer, being very dry, becomes a season of rest for vegetation, and such a luxuriant development is there impossible without artificial irrigation. Plants which may be cultivated in the Transcaucasian region on a large scale, are the tea-plant and bamboo; the cultivation of both has been already attempted, and it is obvious that the warm and moist climate and the plentiful rain-falls in the summer are extremely favourable for such

plants and much resemble the conditions existing in China and Japan, where their culture forms an important part of husbandry.

Quite different conditions exist in the plains of Eastern Transcaucasia, on the lower parts of the rivers Kura and Araxes. Their mean yearly temperature is about the same as at Batoum and in the lower parts of the Rion, from  $13^{\circ}$  to  $15^{\circ}$  C. ( $55.4^{\circ}$  to  $59^{\circ}$  F.) but the winter is considerably colder, in January from  $0^{\circ}$  to  $3^{\circ}$  C. ( $32^{\circ}$  to  $37^{\circ}$  F.), the summers are hotter, in July from  $26^{\circ}$  to  $29^{\circ}$  C. ( $79^{\circ}$  to  $84^{\circ}$  F.). But the greatest difference lies in the fact that the atmosphere is much drier, the rain-fall less (from 8 to 16 inches during the year), and especially, that in summer it hardly ever rains, and vegetation is arrested in its development by being parched. Under such heat and drought agriculture is possible only by artificial irrigation. The large rivers, Kura and Araxes, afford the possibility to irrigate 2,000,000 dessiatines (5,000,000 acres) of land and cover them with a most luxuriant vegetation. This is, without doubt, a country of the future which, more than any other section, can furnish Russian industry with all the cotton it requires and can yield quantities of rice, sesamum and other oil-seeds, grapes, and tender fruits; in one word, it can become for Russia what the Southern States and California are to the United States.

The same conditions, even more accentuated, occur in the Trans-Caspian territory and in the Central Asiatic regions of Russia. The climate is dry; in the valleys the yearly rain-fall does not exceed four to six inches, on the mountain slopes from eleven to sixteen inches; but this occurs almost exclusively during the cold seasons of the year. Artificial irrigation alone has created here luxurious oases. Recently the production of cotton is of great importance, and is nowhere cultivated more to the north than here. The large rivers Amu-Darya and Syr-Darya and Murgab will permit to extend the area of irrigation, and the high temperatures existing during eight months of the year favour the culture of the fruit trees of middle climates, as well as the perennials of hotter regions, such as cotton, jute, sorghum, and sesamum.

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## CHAPTER II.

**The Soil.**

Natural classification of soils and geographical distribution of their different types. Origin of the chief types; their physical, chemical and biological characters.

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**E**UROPEAN Russia may be divided into two vast regions, sharply distinguished from each other in the composition, properties, fertility and origin of their soils. The boundary between them takes in the main a direction from south-west to north-east, from Bessarabia to Ufa, presenting in many places considerable deviations, portions of the soil belonging to the southern region encroaching upon that of the northern lands and vice versa; in places even, the former appears as isolated patches in the midst of the latter. The south-eastern half is commonly called the region of the Chernoziom or "black earth"; the north-western, that of the northern non-Chernoziom lands. This difference in soils, in a botanico-geographical sense, corresponds almost exactly to the division of Russia, into a steppe region corresponding to the Chernoziom, and a woodland. Equally unlike are these two regions in their geological relations: the steppe, or Chernoziom may, in the main, be called a region of lösz, while in the north-western half the surface of the ground is formed of deposits, for the most part consisting of coarser particles.

In order to explain the causes of the indicated differences, it is necessary to point to a few, at any rate, of the features in the most recent botanical and geological history of European Russia.

During the glacial period, as is known, a considerable part of European Russia was occupied by a vast glacier, the southern limit of which in the centre of Russia passed to the north of Kursk, while along the courses of the Don and Dnieper, far away to the south projected branches of the glacier in the form of tongues. The glacier, as it moved from the north-west, brought with it, in the form of a bottom-moraine, a mass of material, ground to different degrees of fineness, presenting a mixture of every kind of rock, over which it had moved. These glacial or pebble deposits on their southern boundary were subjected to a process of sorting caused, probably, by the water from the melting ice, while the fine particles, separated from the general mass,

were carried away afterwards in the form of dust to the south of the limits of the glacier, being here deposited in the form of lösz. In proportion as the glacier retreated to the north, the lösz covered over the pebble deposits that were laid bare. In the east, along the course of the Volga, in the same way the lösz covered the exposed bottom of the vast sea which formerly existed there, and occupied places lying further to the east of it. In this way was formed a vast region of lösz, distinguished here too by its usual peculiarities: it contains a fairly large quantity of carbonate of lime and a comparatively large proportion of soluble salts; it consists of excessively finely ground particles; its whole thickness is unstratified and is threaded with numerous tubules, representing the remains of former roots; in it occur the shells of land molluscs, and there are clearly to be seen traces of the activity of burrowing steppe-rodents. The presence in the lösz of root tubules proves that the deposit of the lösz took place during the existence upon it of vegetation, while a whole series of other signs shows, that even at the time of the deposit of the lösz, the whole region, occupied by it, was already steppe.

A minute investigation of the form of the root-pores shows, that upon the lösz there grew almost exclusively dicotyledonous plants. This suggests that the vegetation in the whole lösz region was like that which is observed even now in the Caspian steppes, where Chernoziom has not been formed in the lösz. The climate at that time in southern Russia, was probably drier than it is at present, which is confirmed by the consideration, that the lösz was carried away to the south of the glacier, and consequently, the prevailing winds at that time were northern, coming from the glacier, and therefore containing little vapour and having the character of the föhn. With the disappearance of the glacier these winds ceased, the climate becoming somewhat moister and therefore favourable to the growth of steppe grasses; from this epoch began the transformation of the upper layer of the lösz into Chernoziom.

Lösz, as indeed all soils consisting of finely ground particles, only permits the existence of steppe vegetation of a short life, and is unfavourable to the growth of trees. This depends in the first place upon the imperviousness of the upper strata of the lösz to water, and in the second, upon its great capacity for absorption, owing to which it can retain much moisture in the upper layers, without allowing it to penetrate deep. For this reason it becomes thoroughly saturated only in the spring, providing a supply of water that is sufficient only for short-lived plants. In the summer the rain water for the most part runs off from its surface, and the soil, moistened only above, rapidly dries up under the influence of the sun's rays, and of the wind.

In such a soil the decay of vegetable remains must proceed very slowly, a fact which is indeed observed in the whole region of the Chernoziom. Manure, ploughed into such a soil to a depth of seven to eight inches, remains ordinarily without alteration during many years. It is hence evident that, with the prolonged existence of vegetation leaving its roots in the soil, and with the very slow putrefaction of the latter, there must occur a gradual accumulation of organic substances which would be mostly the case in the upper layers, where a greater mass of roots remained.

Seeing that the above properties are distinctive not of lösz alone, but of all soils, consisting of finely ground particles, Chernoziom was formed not only upon lösz, but upon other rocks also, as for example, upon the Jurassic clay in the Nizhny Novgorod government or upon limestones in the governments of Simbirsk and Ufa,

from which, after the dissolving-out of the carbonate of lime, soils were formed in the fineness of their particles similar to lösz.

The organic substances in the Chernoziom occur in the finest subdivision, and are intimately mixed with mineral particles; their pulverisation was undoubtedly the work of small animals as earth-worms and larvae of insects, seeing that generally in places inaccessible to such, as under water, organic remains preserve their structure as turf.

In the steppe region of Russia, as in other countries, lösz does not lie continuously. Here and there occur soils of a coarser kind permeable to water, and consequently more favourable to forest vegetation, which were actually occupied by woods. In this way, in southern Russia, vast expanses of steppe alternated with lesser forest reaches; besides this, upon its northern boundary, the steppe was in contiguity with the forests of the northern region. Botanical investigations have recently shown that, on the one hand, the forests, which occurred in the midst of the steppes, did not remain constantly within the same limits, but little by little extended themselves occupying steppe districts in their neighbourhood; on the other hand, along the whole northern boundary of the steppe, the forest gradually encroached from the north, thrusting back the limit of the steppe ever more and more to the south. The causes of this phenomenon consisted in the fact, that in the steppes in winter the snow does not lie deep, being blown off by the wind without hindrance; by the action of the wind, moreover, the snow collects in the skirts of the woods in very large quantities, and from this cause in spring the soil here becomes deeply drenched. Besides this, fallen leaves and twigs create around the forest a narrow zone, favourable to the growth of wood and unsuited to steppe vegetation. It is evident that, in consequence of this, the forest was able to conquer from the steppe ever increasing tracts, thus establishing itself upon the Chernoziom. Eventually, these forests were cut down, so that in many places there did not remain the slightest traces of them; but, under the influence of trees Chernoziom undergoes such characteristic changes, that it is almost always possible to determine with certainty, whether on a given spot there was formerly forest. At the same time, investigations of the deeper strata on the same spot incontrovertibly demonstrate the existence here of steppe earlier than wood: the deep strata exhibit here typical lösz, and there occur in the soil the filled-up burrows of steppe rodents. On account of their peculiar colour, soils formed from Chernoziom under the influence of forest, bear the name of Gray Forest Lands.

The large quantity of soluble salts contained in the lösz is the cause of the occurrence within the Chernoziom of salt-marshes. They are particularly abundant in the south-east, where the Caspian deposits, ordinarily saliferous, do not lie deep. The formation of salt-marshes is due to various causes: sometimes they are situated in slight depressions, where the salt has been deposited by water flowing from the surrounding localities, at others they are formed upon the spots whence issues saline ground water.

Chernoziom, gray forest lands and saltmarshes are the chief types of soils in the Chernoziom region, occupying almost the whole extent, so that other soils are met with only rarely, and together occupy comparatively small space.

Of such other soils, in the region in question, those of a calcareous and sandy character are chiefly met with; the calcareous have their largest extent along the right bank of the Volga in the governments of Simbirsk and Saratov, and are besides, to be

met with in some of the central governments; immense areas of shifting sands occur in various places, usually near rivers and seas; here and there, as an exception, the soil is represented by clayey pebble formations.

The chief chemical and physical properties of the above-indicated soils in the steppe region, as far as they have been cleared up by existing investigations, are set forth below.

### I. CHERNOZIOM.

The fertility of the Chernoziom has been long known, but a detailed investigation of this remarkable soil was only recently undertaken. The accumulation in it of organic substances was first explained by Ruprecht a member of the St. Petersburgh Academy of Sciences, who at the same time also pointed out the peculiar character of the Chernoziom flora. Subsequently the investigations of Ruprecht were considerably supplemented; the origin of the Chernoziom and its properties were in particular elucidated by the labours of Prof. Dokuchaev and Prof. Kostychev; of botanical investigations, having reference to the Chernoziom, the works of Prof. Zinger and Korzhinsky deserve special notice.

The geographical distribution of the Chernoziom including the gray forest lands of the same region, derived from it within the limits of European Russia, in broad outline, is the following: its northern boundary begins east of the Ural chain where the mountainous region gives way to the plain, this formation occurring in the government of Perm in the Shadrinsk and Kamyshev districts, and in the government of Orenburg in the districts of Cheliabinsk, Troitsk, Verkhneuralsk and, partly, Orsk. To the west of the Ural chain, begins in the governments of Perm and Ufa, in the north in the form of separate islands, e. g., in the districts of Kungur and Krasnoufimsk; and then from the districts of Ufa and Birsk, closely following the course of the rivers Biela and Kama, it crosses into the Kazan government, while to the south of this boundary there also occur distinct non-Chernoziom islets. The Chernoziom crosses to the right bank of the Volga near Tetiush, and its border takes a trend to the south-west, passing south of Alatyr; here it is frequently interrupted by other lands, a fact which is observed also further to the south along the Volga till Syzran. On the right bank of the Sura it retreats far to the north, up to the river Piana, and hence its general boundary sweeps sharply to the south-west nearly as far as Tambov; along the left bank of the Tsna, it again ascends northward to the town of Shatsk; and hence its edge again takes a south-westerly direction, passing close to the towns of Sapozhok, Pronsk and Krapivna, then bends abruptly to the south almost to Oriol, and preserves this direction, passing nearly by Sevsk, Glukhov and Konotop, and intersecting the Dnieper south of Kiev. Hence its boundary takes a direction almost due west along the 50th parallel. Moreover, to the south-west of the Dnieper there is comparatively little unaltered Chernoziom, but for the most part only gray forest lands.

The southern boundary of the Chernoziom, on the south-west passes north of the shore of the Black Sea, descending further south on the left bank of the Dnieper; then it crosses into the Crimea, and reaches as far south as the Crimean chain; further its

boundary runs along the shore of the Sea of Azov to the river Kuban, and south of this towards the east, penetrating in long tongues into the region of sands along the course of the Terek and Kuma. Hence it abruptly ascends almost due north, east of the course of the Don, and coincides with the Volga on its right bank north of Tsaritsyn. It crosses to the left bank of the Volga somewhat north of the river Great Irgiz, and beyond the Volga its southern boundary takes approximately the direction of the town of Uralsk. However, in this part it is impossible to indicate exactly its boundary, seeing that to the north there occur numerous non-Chernoziom islands, for the most part saline, and further south, among the saltmarshes and wormwood steppes, are scattered islands of Chernoziom, to the south becoming rarer and diminishing in size. Such a replacement of Chernoziom by saltmarshes occurs also in the south-east in the government of Stavropol, in the territory of the Don, and in the government of Saratov.

The total area of the Chernoziom region may be estimated approximately at 260,000,000 acres.

In the Chernoziom within the limits indicated, and along its northern boundary, occur many gray forest lands, the chief situations of which will be shown below.

In chemical composition Chernoziom is not everywhere identical; Chernoziom, formed upon limestones and clays, is not homogeneous with that upon lösz; the latter in various localities is not the same, depending upon differences in the original composition of the lösz. Nevertheless all Chernoziom soils have many common characters, namely:

1. A considerable proportion of organic substances, and in consequence of this, a dark colour. The proportion of humus in it varies from 4 to 16 per cent. The greatest proportion of humus is observed in Chernoziom upon limestone, and lösz peculiarly rich in carbonate of lime. In such soils the high proportion of humus arose not only from the accumulation of organic substances, but also from the circumstance that the washing-out of the carbonate of lime from the original soil increased the percentage of all the remaining substances, and especially of the humus. In dependence upon the greater or less proportion in the lösz of clay and sand, the proportion of humus also changes: with a greater proportion of sand it is less, in consequence of the greater permeability of the soil to water and air, whence the decomposition of organic substances proceeded more rapidly.

2. The distribution of organic substances in the various strata of the Chernoziom is everywhere the same: the greatest quantity of humus is observed in the upper layer, while afterwards its proportion gradually diminishes with the depth, as appears from the following examples:

1. Chernoziom from Voronezh.
2.      »      »      Ekaterinoslav.
3.      »      »      Kharkov.
4.      »      »      Ufa.

Depth:	1.	2.	3.	4.
	Per cent of humus.			
0—6 inches . . . . .	5·42	9·64	10·11	9·29
6—12 " . . . . .	4·83	7·71	6·81	6·23
12—18 " . . . . .	3·63	6·71	5·57	4·33
18—24 " . . . . .	2·56	5·61	4·36	2·20
24—30 " . . . . .	2·58	3·51	3·58	—
30—36 " . . . . .	1·88	3·18	1·93	—
36—42 " . . . . .	1·29	1·56	—	—

In general the layer of soil of a dark colour most often occurs in the Chernoziom from 1 to 3 feet deep; in calcareous soils it is generally shallower. But in general exact measurements of the depth of this layer are impossible, in consequence of the gradual diminution of the intensity of the tint.

3. The proportion of zeolithic substances (i. e., substances soluble in boiling muriatic acid, together with silicic acid extracted from the insoluble residue by weak solutions of alkalis) in the Chernoziom is in general exceedingly great, from 15 to almost 40 per cent. Besides this, zeolithic substances contain lime in greater quantity than magnesia, and as calcareous zeoliths are for the most part more easily soluble than magnesia, the composition of the Chernoziom from this point of view is exceedingly favourable to plants. At the same time, it must be observed that if one examines layers of Chernoziom from various depths at one and the same place, it appears that the difference in their composition is confined only to a variation in the proportion of humus and carbonate of lime. If we exclude these two substances, and calculate the composition of the remainder, it proves to be identical at different depths. In confirmation of what is here said, two tables are given: in the first is shown the composition of Chernoziom from nine different governments; in the second, the composition of various layers of Chernoziom from one and the same place.

The fifth soil of this table is exhibited as an example of an extremely small proportion of zeolithic substances; soils 1 and 7, as examples of the extremely high proportion of these substances. Further, soil 1 represents Chernoziom formed upon Jurassic clay, and soil 9, that upon limestone. In the latter, at a depth of from 12 to 18 inches, the proportion of carbonate of lime reaches already 60 per cent.

## 1. Composition of Chernoziom from nine governments.

	* 1. Nizhni Novgorod	2. Tula gov.	3. Kursk	4. Tambov	5. Voronezh	6. Poltava	7. Saratov	8. Orenburg	9. Ufa gov.
	P	E	R	C	E	N	T.		
Hygroscopic water . . . .	—	10·54	6·51	7·59	5·00	6·77	7·69	7·24	5·11
Dry soil contains:									
Humus . . . . .	10·76	8·31	6·22	7·84	5·76	9·35	7·36	16·34	9·61
Chemically combined water	6·02	4·28	3·69	4·89	4·63	5·26	4·11	7·26	3·67
Loss on ignition . . . .	16·78	12·59	9·91	12·73	10·59	14·61	11·47	23·60	13·28
Mineral substances . . . .	83·22	87·41	90·09	87·27	89·41	85·39	88·53	76·40	86·72
Of which:									
1. Zeolithic substances:									
Silica . . . . .	17·09	11·90	12·89	13·10	7·08	13·81	17·05	14·27	9·22
Alumina . . . . .	6·59	6·35	6·50	7·02	2·81	{ 10·37	{ 11·77	7·25	7·48
Oxide of iron . . . .	4·06	2·34	3·03	3·15	2·05				
» manganese . .	0·01	0·10	0·04	0·12	0·07	0·13	0·11	?	?
Lime . . . . .	1·68	1·13	1·10	1·08	0·90	1·30	1·07	1·11	0·65
Magnesia . . . . .	1·10	0·60	0·60	0·37	0·55	0·70	0·60	0·71	0·85
Potash . . . . .	1·00	0·43	0·40	0·51	0·35	0·72	0·85	0·63	0·51
Soda . . . . .	0·17	0·05	0·05	0·04	0·04	0·04	0·09	0·03	0·07
Phosphoric acid . . .	0·25	0·21	0·15	0·19	0·12	0·17	0·15	0·30	0·24
Sulphuric acid . . . .	0·02	0·06	0·04	0·02	0·10	0·09	0·03	0·08	0·01
	31·97	23·17	24·80	25·60	14·00	27·33	31·72	28·79	19·03
2. Carbonate of lime . . .	—	—	—	—	—	—	—	1·33	13·48
3. Clay and sand. . . . .	51·25	64·28	65·31	61·71	75·51	58·07	56·84	46·41	54·35

\* Prof. Schmidt's analysis. All other analyses and data of various investigations in this and the following tables are from the works of Prof. Kostychev, in part unpublished.

## THE SOIL.

## 2. Soil from Ekaterinoslav government \*.

	0—6 Inches.	6—12 Inches.	12—18 Inches.	18—24 Inches.	24 Inches.	30 Inches.	30—36 Inches.	36—42 Inches.
	P	E	R	C	E	N	T.	
Hygroscopic water . . . . .	8·47	8·61	8·55	9·87	9·14	8·68	7·83	
In dry soil:								
Humus . . . . .	9·64	7·71	6·71	5·61	3·57	3·18	1·56	
Chemically combined water . . . . .	3·98	2·46	2·14	2·22	2·21	2·23	2·02	
Loss on ignition . . . . .	13·62	10·17	8·55	7·83	5·78	5·41	3·58	
Mineral substances . . . . .	86·38	89·83	91·45	92·17	94·22	94·59	96·42	
Of which:								
1. Zeolithic substances:								
Silica . . . . .	17·19	17·91	18·01	18·24	18·63	18·70	16·71	
Alumina . . . . .	7·29	7·64	7·81	7·89	7·95	7·90	7·02	
Oxide of iron . . . . .	4·68	4·99	5·01	5·40	5·22	5·28	4·65	
» manganese . . . . .	0·19	0·20	0·21	0·19	0·21	0·20	0·11	
Lime . . . . .	1·52	1·38	1·41	1·38	1·44	1·46	1·77	
Magnesia . . . . .	1·51	1·67	1·66	1·60	1·73	1·71	1·42	
Potash . . . . .	0·70	0·78	0·77	0·80	0·82	0·81	0·72	
Soda . . . . .	0·06	0·10	0·10	0·11	0·11	0·10	0·08	
Phosphoric acid . . . . .	0·21	0·19	0·18	0·17	0·17	0·17	0·15	
Sulphuric acid . . . . .	0·02	0·02	0·02	0·03	0·03	0·33	0·04	
	33·37	34·88	35·18	35·81	36·31	36·37	32·05	
2. Carbonate of lime . . . . .	1·41	1·08	1·08	1·31	1·18	1·13	14·04	
3. Clay and sand. . . . .	54·82	53·93	54·88	55·07	56·74	57·11	49·85	

## Composition of the mineral part of the same soil,

Excepting carbonate of lime and loss on ignition.

	0—6 Inches.	6—12 Inches.	12—18 Inches.	18—24 Inches.	24—30 Inches.	30—36 Inches.	36—42 Inches.	
	P	E	R	C	E	N	T.	
a. Zeolithic substances:								
Silica . . . . .	20·23	20·18	19·93	20·07	20·02	20·18	20·29	
Alumina . . . . .	8·58	8·61	8·65	8·69	8·69	8·45	8·63	
Oxide of iron . . . . .	5·51	5·61	5·54	5·96	5·96	5·64	5·64	
» manganese . . . . .	0·22	0·21	0·23	0·21	0·21	0·21	0·13	
Lime . . . . .	1·81	1·69	1·56	1·51	1·51	1·56	2·02	
Magnesia . . . . .	1·80	1·88	1·83	1·76	1·76	1·83	1·71	
Potash . . . . .	0·82	0·88	0·85	0·88	0·88	0·86	0·86	
Soda . . . . .	0·06	0·12	0·11	0·12	0·12	0·11	0·10	
Phosphoric acid . . . . .	0·25	0·21	0·20	0·19	0·18	0·18	0·18	
Sulphuric acid . . . . .	0·03	0·02	0·02	0·03	0·03	0·04	0·04	
	39·30	39·31	38·92	39·42	39·01	38·89	39·59	
b. Clay and sand. . . . .	60·70	60·69	61·08	60·99	60·99	61·11	60·41	

\* The figures in this table are the mean of 2 or 3 analyses agreeing with each other; the composition of the mineral part was obtained by simple enumeration.

The composition of the mineral portion of this soil, as is seen from the second part of the table, proves to be identical at different depths, and only in the proportion of lime and phosphoric acid are there observable variations between different layers: in the upper layer both these substances are contained in the greatest quantity, but afterwards the proportion of them diminishes with the depth. The same is observed in all Chernoziom soils, investigated up to the present time. It is evident that the amount of both these substances diminishes with the depth, proportionately to the amount of humus, and this is easily understood, because the lime is contained in the humus partly in the form of guminous salts, and phosphorus enters into its composition. The soil, whose composition is shown in the second table, may serve besides, as a rare example in this respect, that in its zeolithic substances the lime does not exceed the magnesia.

Corresponding to the great proportion of zeolithic substances, all Chernoziom soils are distinguished by their high capacity for absorption, and as the absorption of any substance ordinarily is accompanied by the solution of another, the absorptive capacity of Chernoziom is evidence of the relatively easy solubility of its zeolithic substances. As a matter of fact, if a parallel investigation be made of Chernoziom and non-Chernoziom soils, it appears that, with an identical absolute quantity of zeolithic matter (for which it is necessary to take a correspondingly greater quantity of the northern soil), the absorptive capacity of the Chernoziom proves incomparably higher. This affords a very good explanation of the remarkable fertility of this soil: from the easy solubility of the substances contained in it, it is able to furnish in abundance the plants growing upon it with nutritious mineral substances. Besides this, the considerable proportion in it of organic substances completely provides the plants with nitrogen. The humus of Chernoziom contains on an average 4 to 6 per cent of nitrogen; consequently, with a proportion of 8 to 10 per cent of humus, Chernoziom contains from 0·3 to 0·6 per cent of nitrogen, or almost as much as in common manure.

It is remarkable that, on investigating the absorptive capacity of different layers of Chernoziom from one and the same place, soil from the deeper layers possesses the greater absorptive capacity.

In the following table is shown the absorptive capacity of different layers of Chernoziom from the government of Taurida. In the first column is shown the absorption of phosphoric acid from a solution containing 0·1058 gr. of phosphoric anhydride; in the second column, the quantity of lime absorbed from a solution containing 0·229 gr. of oxide of calcium; in the third column, the quantity of ammonia, from a solution containing 0·2629 gr. of this substance; in all cases there were 50 gr. of soil.

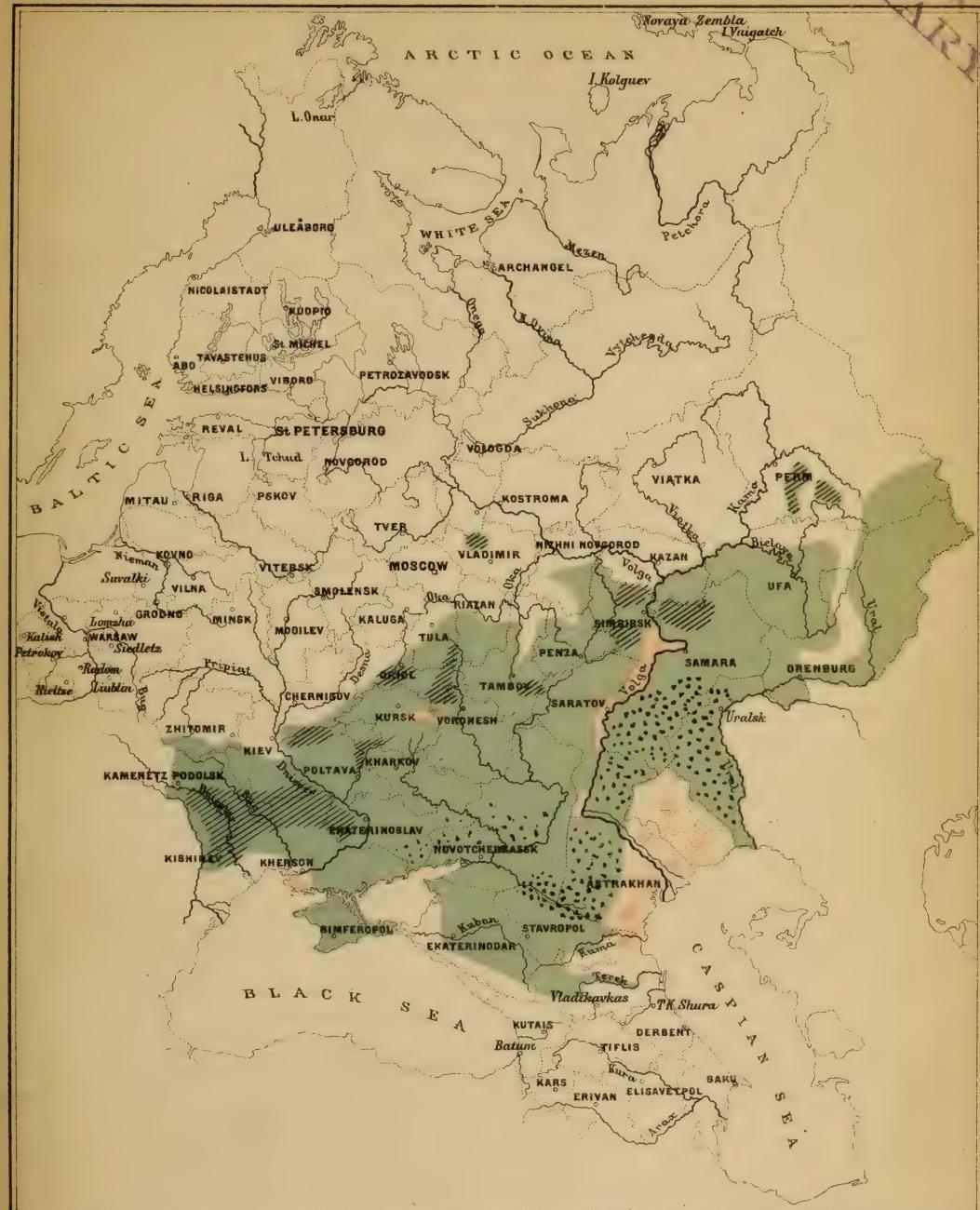
Depth.	1.	2.	3.
0— 6 in.	0·030	0·038	0·092
6—12 »	0·033	0·040	0·107
12—18 »	0·033	0·044	0·108
18—24 »	0·040	0·053	0·109
24—30 »	0·045	0·056	0·109

The cause of the less absorptive capacity of the upper layers consists evidently in the fact, that the guminous compounds possess this property in a less degree than the zeolithic

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# MAP OF THE PRINCIPAL SOILS OF THE CHERNOZIOM REGION

Chapter II. Soil, Map No. 1.



Del. P. A. Kostychev.

Cartogaphical works A. Jlyne S.P.B.

Localities of:



Lime soil.



Gray forest land.



Chernozem



Sand.



Salt marshes dispersed in small areas.



substances. At the same time this proves that already before the formation of the Chernoziom, the soils over the whole steppe region of Russia possessed all the elements of fertility, with the exception of organic substances.

The physical properties of Chernoziom are not less remarkable, so that if they be taken in due measure into consideration, the cultivation of this soil becomes comparatively easy, notwithstanding that the majority of the Chernoziom soils belong to the number of heavy soils, in consequence of the considerable proportion of clay. Thus, e. g., in the soil from the Ekaterinoslav government, the composition of which is shown in the second table, on analysis by Schlesing's method, there was found:

Depth.	* Clay.	Sand.	Sand to 1 pt. of clay.
0— 6 in.	34·5 per cent	50·5 per cent	1·46
6—12	35·3	50·5	1·51
12—18	35·7	54·3	1·52
24—30	37·0	56·1	1·51
30—36	37·7	56·7	1·51
36—42	30·3	50·8	1·67

The proportion of clay in the soil under consideration approaches the maximum given by Schlesing for soils in general. Besides this, in the Chernoziom there is contained a quantity of amorphous organic substances capable of knitting together the other particles with still greater force than clay. All this taken together makes the Chernoziom very tenacious, capable of forming after ploughing in a dry season such solid clods that their further treatment is a matter of great difficulty. But the humus, as is known, after drying loses the capacity to bind other particles, and even deprives clay which is intimately mixed with it of this property. Therefore, dry clods of Chernoziom, after moistening by the rains, easily crumble under the action of a light harrow, and even from their own weight. The Chernoziom then assumes a structure, called by Russian practical farmers "downy". Having been for some time in a moist condition, after the occurrence of renewed further decomposition of the organic substances, the Chernoziom again becomes tenacious and capable of forming clods; the appearance of this capacity may then serve as one of the best signs of the ripeness of arable land. As a matter of fact, to carry out the operation of sowing; when it is still in the downy condition, would be unfavourable: downy Chernoziom easily comes to the surface after rains and becomes impermeable to water and air. Best of all, if it is converted into a finely-clodded state, then it long retains this structure, remains freely permeable to water and air, preserves moisture well, and in consequence of all this, the existence of vegetation upon it is then best of all secured. The impermeability of Chernoziom to water and air, even with the absence of coherence between its particles, is caused by the fineness of the latter. In this respect it is absolutely analogous to the soils of the North American prairies, and, in general, to the lösz of different countries.

\* On comparison of these figures with those of table 2, it must not be forgotten that by Schlesing's process, together with the clay there are removed amorphous zeoliths, possessing the physical properties of clay; together with sand, there are in the same way precipitated zeoliths, forming dense grains resembling sand in their physical properties.

As far as concerns the treatment of Chernoziom best calculated to secure good crops, the guiding rule should be the following: Chernoziom possesses in superabundance all substances necessary to plants; but as the climate of the steppe region is comparatively dry, and rains fall there irregularly, crop-failures are comparatively frequent, and are always caused by an insufficiency of water. Consequently, the cultivation of the Chernoziom should be carried out in such a way that the soil may absorb the greatest possible quantity of rain water, and may as slowly as possible evaporate it. As the summer rains here are never sufficient for securing to plants enough water, the saving of the winter moisture becomes a matter of the first importance.

For the attainment of this object, the following measures are indispensable for winter crops:

1. Bare fallow, or the earliest possible first tilth of the fallow in spring.
2. The constant maintenance of the upper layer of the field in a friable condition, so that there may always be on the surface a powdery layer of about three inches thickness, not having capillary connexion with the layers of arable land lying below it. This layer serves properly as a cover to the deeper strata and preserves them from drying up; at the same time, besides the saving of water, there is also attained a better chemical preparation of the Chernoziom for the future crop, as from the retention of moisture in it the decomposition of organic matter, and the weathering of minerals proceeds at a high rate. At the same time, by frequent mellowing of the surface, weeds are destroyed. By keeping the upper layer friable, the yields of winter crops upon Chernoziom are satisfactory even in the very driest years. In the absence of a light shallow layer upon the surface, no other methods, and especially deep ploughing, give the desired results.

To guarantee spring crops, ploughing in the autumn is indispensable, for thereby the soil receives the greatest provision of winter moisture. In the spring, it is necessary as soon as possible to harrow the arable land, in order to establish upon it a friable protecting layer, and then only to proceed to sow.

Recently broken-up Chernoziom steppes are distinguished ordinarily by such fertility that in the course of a long series of years there is no need of manuring. Chernoziom, long under the plough, is then usually fertilized; for which purpose, animal manure has been exclusively employed.

In places where there is much free land, so that the population is not in a position to plough all the steppes, continuous sowings in one place are impossible with the method of cultivation in vogue there. In such localities spring sowings are almost exclusively practised after a single ploughing, and therefore, a few years after the first ploughing rank weeds spread in such quantity that the crops become precarious, and at the same time, in consequence of the alteration of the soil from ploughing, the quality of the grain becomes inferior. Such places are then abandoned for a long time to waste, upon which there occurs a characteristic succession of vegetation: in the first years, the waste becomes overgrown with annual and biennial tall weeds of the orders Cruciferae, Compositae, Umbelliferae, etc., bearing the common name of *burián*. After this, for several years, it becomes covered with grasses having rhizomes, (*Hierochloa borealis*, *Triticum repens*, *Bromus inermis*, and, in the south-east, *Triticum ramosum*), and finally, after 12, 15 to 20 years, upon the waste there appear the steppe grasses, *Festuca ovina*, *Stipa pennata* etc., while the former denizens completely disappear.

The land after this is considered to have recovered its fertility, the crops upon it do not suffer from weeds, the soil assumes on ploughing a finely-clodded structure, and, in consequence of the accumulation of organic substances a herd-kernelled grain, vitreous and rich in nitrogen, is obtained.

After four to six years ploughing, hard wheat can no longer be sown, and the field is again left waste, whereupon there occur the same changes as before.

With the employment of manure upon Chernoziom, most important of all is its shallow ploughing-in, because manure ploughed in deep ordinarily does not decompose in the Chernoziom, and does not increase the fertility of the soil; and, moreover, it interrupts the capillary connexion between the layers below and above it. The layer occurring above the manure then easily dries up, leaving as a consequence failures of crops. Therefore, from inexperienced farmers of the steppe zone are often heard complaints, that with the employment of manure the corn dries up. With a shallow ploughing-in of the manure, it not only rapidly decomposes, but also preserves the soil from parching, and, consequently, brings a double advantage.

## 2. GRAY FOREST LANDS.

It is pointed out above, that upon the Chernoziom in places grew forests, under which an alteration of the soil took place so considerable and characteristic, that it is even easy with the naked eye, to distinguish forest land from Chernoziom unaltered by anything. This change is due to two circumstances: first, in the woods in winter a quantity of snow collects, while in the steppes it is carried away by the wind, in consequence of which the upper layer of the soil becomes thoroughly saturated with water; second, upon the surface of the soil in the forest, there is a layer of fallen leaves and boughs which hinders the drying-up of the surface of the soil; at the same time the deep roots of the trees extract water by preference from the deeper and not from the upper layers of the soil. From these causes, the upper layer of forest soil is always much moister than the corresponding layer of steppe soil, and hence the decomposition of organic substances in the former situation proceeds incomparably quicker. Moreover, the protective layer of leaves and boughs in the wood hinders the passage of oxygen into the soil, as the oxygen is absorbed by the putrefying substances. Therefore, in the forest soil, organic substances yield products, formed without access oxygen, and among them a quantity of crenic acid, which, as also all its salts, has a white colour. The presence of these substances lends the forest soils a peculiar gray hue, from which comes their name; besides, in these soils there are very frequently here and there white spots and stains. From the same cause, in forest soils there is an almost total absence of nitric acid.

The salts of crenic acid, as is known, are easily soluble in water; where the water saturates the forest soil, they are dissolved out of its upper layers; these substances are deposited lower, where the greatest quantity of water is detained, i. e., in the layer from which trees chiefly derive their water. This stratum takes in consequence, in the course of time, a peculiar appearance: the soil becomes dense, and easily falls to pieces in small, solid clods, the surface of which is usually covered with an ashen or white powder, evidently in consequence of

the fact that through the cracks between the clods there soak chiefly solutions containing crenic acid.

In consequence of the increased decomposition of organic substances, forest soils usually contain less humus than the neighbouring unchanged Chernoziom. Besides, they are generally not so compact and heavy as compared with Chernoziom, because amorphous zeoliths are most of all exposed to solution through crenic acid, and so the proportion of those substances which serve as a cement is diminished, binding together the other particles.

To alter the properties of Chernoziom as they are altered by forests, is very easy: it is necessary to place the soil in a tall cylindrical vessel, and to cover it with a layer of tree leaves. It must be kept constantly moist, being watered every two or three days sufficiently to allow part of the water to pass through the whole thickness of soil. By this method, the soil from the Ekaterinoslav government, the composition of which is given in the second table, was in the course of three years transformed from black to a perfectly gray hue, and there remained in it about 2·5 per cent. of organic substances. In the water that had passed through there was very little organic matter, so that its disappearance was caused chiefly by decomposition and not by solution.

In composition and physical properties, forest lands are like Chernoziom, containing little humus and zeolithic substances, although, in the lands where forest establishes itself upon rich Chernoziom, the land under it nevertheless remains very rich in humus, as may be seen from the following table, containing the results of the analyses of four layers of soil in the Voronezh government from a very ancient forest there:

	Layer 0 to 12 in.	Layer 12 to 18 in.	Layer 18 to 24 in.	Layer 24 to 30 in.
	P E R	C E N T.		
Hygroscopic water . . . . .	6·39	6·69	6·87	6·32
In dry soil:				
Humus . . . . .	9·78	7·44	4·00	3·85
Chemically combined water . . . . .	3·26	2·92	2·46	2·25
Loss on ignition . . . . .	13·04	10·36	6·46	6·10
Mineral substances . . . . .	86·96	89·64	93·54	93·90
Of these:				
1. Zeolithic substances:				
Silica . . . . .	13·68	17·75	17·93	17·16
Alumina . . . . .	7·57	8·53	10·01	10·05
Oxide of iron . . . . .	2·86	3·79	3·52	3·27
» manganese. . . . .	0·04	0·09	0·09	0·09
Lime . . . . .	1·57	0·91	0·90	0·89
Magnesia. . . . .	0·35	0·42	0·68	0·91
Potash . . . . .	0·73	1·21	1·00	0·69
Soda . . . . .	0·09	0·12	0·09	0·06
Phosphoric acid. . . . .	0·31	0·23	0·21	0·11
Sulphuric acid. . . . .	0·01	0·02	0·01	0·01
2. Clay and sand . . . . .	27·24	33·07	34·43	33·14
The mineral part contains:	59·26	56·62	59·11	60·75
1. Zeolithic substances. . . . .	31·38	36·87	36·79	35·29
2. Clay and sand. . . . .	68·32	63·13	63·21	61·71

This earth is distinguished from real Chernoziom only by its grayish hue, and further by the fact that, in the mineral part of the upper layer, there is contained less zeoliths than in the deeper layers, evidently in consequence of the washing-out of the upper layer.

Corresponding to their origin, forest gray lands do not occupy distinct regions, but are scattered throughout the Chernoziom and along its northern boundary in those spots, where the steppe was contiguous with forests, which again were scattered over the Chernoziom without any regularity. Therefore, gray forest lands occur in all the Chernoziom governments without exception; thus, e. g., in the Poltava government, fairly central in its situation with respect to the Chernoziom region, according to the investigations of Prof. Dokuchaev, the gray lands occupy as much as 30 per cent. of the whole area. Considerable, almost continuous, areas of such lands occur in the governments of Penza, Simbirsk, Samara and Saratov; next, in the governments of Tula, Tambov, Riazan, Oriol and, in part of Voronezh; of their considerable distribution in the southwest, mention has been made above. Remarkable, furthermore, are the gray lands, which have originated from Chernoziom, occurring in the form of islands to the north of the common limits of the steppe region in the governments of Vladimir, Perm and Ufa.

In reference to cultivation and manuring, gray lands are identical with Chernoziom; but as they are less compact, it not unfrequently requires special care not to convert them into the pulverescent condition, in which they easily rise to the surface after rains. From treatment with manure and cultivation, forest lands sometimes very quickly become black in consequence of the oxidation of the crenic compounds. Then the colour of the layer reached by the plough in no wise differs from the corresponding layer of the Chernoziom, and only by the deeper layers is it possible to determine their origin.

### 3. SALT MARSHES.

Occurring among the Chernoziom in the form of patches, sometimes alternating with it, and for the most part situated in its neighbourhood, the saltmarshes are distinguished from Chernoziom in chemical composition only in two respects: first, the saline earth contains ordinarily less humus; second, in saline earths are contained soluble salts in such quantities that ordinary plants cannot grow.

The difference, in the proportion of humus, between saltmarshes and Chernoziom is due to two causes: upon the saltmarshes establish themselves such plants as do not produce an accumulation of humus in soils; and further, in some cases, through saline soils there ooze, from above or from below, large quantities of water, contributing to the decomposition of the humus.

In order to show the variation in the proportion of humus in the passage from saline to Chernoziom, the following examples may be taken:

	H u m u s .
Chernoziom of the Kharkov government . . . . .	5·55 per cent.
Saltmarsh at a distance of 5 ft. from the same . .	2·42      "
Chernoziom of the Orenburg government . . . . .	9·30      "

	H u m u s .
Saltmarsh at a distance of 20 ft. from the same . . . . .	3·66 per cent.
Chernoziom from the same government . . . . .	10·48 "
Saltmarsh 10 ft. distant . . . . .	1·38 "

The proportion of soluble salts in saltings is at times very insignificant; cases even occur, when a saltmarsh, lying upon an elevation, contains less soluble salts than good land in a depression, where the considerable proportion of water, even with a large quantity of salts, makes the soil solutions so weak, that the existence of ordinary plants becomes possible.

The following examples, from the government of Kharkov, show the difference in the quantity of soluble salts, between saltmarshes and ordinary soils lying side by side, not more than ten to fifteen feet from each other.

O r d i n a r y   s o i l s .	S a l i n e .
0·061 per cent . . . . .	0·258 per cent salts soluble in water.
0·059 " . . . . .	0·288 " " " " "
0·234 " . . . . .	{ 7·555 " " " " " 5·591 " " " " "

The third of these examples presents a soil lying in a depression; here a fertile land contains as much soluble salts, as a saltmarsh in other places.

Saltmarshes with a small proportion of soluble salts in years rich in rains, yield very good harvests, sometimes more abundant than upon ordinary lands, obviously because the soil solutions in them are then so weak, that they become favourable even for ordinary plants.

The chief region of salines is South Eastern Russia, near the Caspian Sea, where the saliferous Caspian deposits serve as an abundant source of soluble salts; elsewhere saltmarshes are scattered among the Chernoziom, principally in the southern governments, in inconsiderable areas, usually in shallow hollows or upon the southern slopes of ravines.

#### 4. C A L C A R E O U S   S O I L S .

The largest region occupied by these soils is along the right bank of the Volga, in the governments of Simbirsk and Saratov. The upper layer of these soils consists for the most part of finely ground particles, among which in small quantity occur fragments of limestone. Under this layer, for a considerable depth, there is found chalky rubble. The carbonate of lime is usually dissolved out from the upper layer to a greater or less extent.

Upon the depth of the upper layer depends the fertility of these soils. For agricultural purposes only those of them are suitable, in which the upper layer is deep. The others, and they are in a great majority, are occupied with a very scanty steppe vegetation or with forest.

Some of these soils change to Chernoziom, and in the table appended are given examples showing this transition.

**Calcareous soils of Simbirsk and Saratov, from the right bank  
of the Volga.**

	1.	2.	3.	4.			
	P	E	R	C	E	N	T.
	1·39	4·55	3·52	4·87			
Hygroscopic water.. . . . .	1·39	4·55	3·52	4·87			
Dry soil:							
Humus .. . . . .	3·78	8·23	3·08	4·22			
Chemically combined water.. . . . .	3·20	7·89	2·17	3·89			
Loss on ignition .. . . . .	6·98	16·12	5·25	8·11			
Mineral substances.. . . . .	93·02	83·88	94·75	91·89			
Of these:							
1. Zeolithic substances:							
Silica .. . . . .	1·84	5·30	14·92	15·36			
Alumina .. . . . .	0·78	1·96	8·03	8·18			
Oxide of iron .. . . . .	0·38	0·70	8·46	4·59			
» manganese .. . . . .	0·09	0·01	1·15	0·08			
Lime.. . . . .	0·55	0·52	0·56	0·49			
Magnesia * .. . . . .	0·78	2·25	2·59	0·83			
Potash .. . . . .	0·08	0·59	0·56	0·60			
Soda.. . . . .	0·10	0·05	0·47	0·13			
Phosphoric acid .. . . . .	0·05	0·05	0·09	0·08			
Sulphuric acid.. . . . .	0·07	0·10	0·04				
	4·72	11·53	36·87	30·29			
2. Carbonate of lime .. . . . .	87·05	69·94	34·35	9·60			
3. Clay and sand.. . . . .	1·58	2·49	23·54	52·01			

**5. SHIFTING SANDS.**

More or less extensive areas of shifting sands or dunes are situated either in the neighbourhood of seas, as the Black and Caspian, or along the course of rivers, and they usually present alluvial formations. Besides, along the northern boundary of the Chernoziom there exists an almost continuous zone of sands, separating the Chernoziom from the northern lands. These sands evidently exhibit the sum of the coarse products of the wear of pebble drifts by water.

Almost all the more or less considerable tracts of shifting sands were formerly occupied by forests, but with the cutting down of the latter, from the irrational use of the soil so freed from wood, they have in places been reduced to such a condition that they are easily transferred by the wind, and in consequence of this their area is ever increasing.

\* Part of the magnesia occurs undoubtedly in the form of carbonate, which could not however be taken into account in the table, from the impossibility of its exact determination.

The existence of shifting sands is chiefly maintained by the pasture of cattle upon them. If they be only let alone, they little by little become overgrown by vegetation, and pass into a firm condition. Such a change is partly helped by the addition to the sands of organic substances from the plants growing upon them, and partly by the carrying of dust from the surrounding Chernoziom. In consequence of this the sands become firm, and receive another colour: from white or pale yellowish, they become gray.

The hardened sands very easily break up afresh from the pasture of cattle, the small particles contained in them are borne away by the wind, and they again become perfectly white and free from other particles, the size of the grains of sand varying within the limits of 0·1 and 0·25 millimetre. In consequence of the fact that these sands existed once under forest, in them at a greater or less depth occurs not rarely a compact, almost stony layer, answering to what is called *orthstein* in Germany, or *alios* in France. To give a clearer idea of what has been said, below are given the analyses of sands, found near the mouths of the Dnieper:

№ 1 represents a compact sand;

№ 2      "      " sand, only just broken up;

№ 3      "      " pure sand-dune;

№ 4      "      " dense layer from a depth of about four feet, answering to the stratum called *alios*.

All these samples are taken from a distance of about 100 feet from each other.

#### Sandy soils from the lower reaches of the Dnieper.

	1.	2.	3.	4.
	P	E	R	C E N T.
Hygroscopic water . . . . .	0·55	0·17	0·13	4·09
Dry soil:				
Humus . . . . .	0·29	0·01	0·01	0·11
Chemically combined water . . . . .	0·77	0·30	0·29	2·95
Loss on ignition . . . . .	98·94	0·31	0·30	3·06
Mineral substances . . . . .	98·94	99·69	99·70	96·94
Of these:				
1. Zeolithic substances:				
Silica. . . . .	3·10	0·62	0·50	8·80
Alumina . . . . .	1·33	0·27	0·22	6·03
Oxide of iron. . . . .	0·40	0·07	0·06	2·35
" manganese . . . . .	0·02	0·001	0·002	0·02
Lime. . . . .	0·09	0·01	0·04	0·23
Magnesia. . . . .	0·07	0·02	0·03	0·18
Potash. . . . .	0·11	0·02	0·02	0·24
Soda. . . . .	0·02	0·01	0·01	0·02
Phosphoric acid. . . . .	0·02	0·01	0·01	0·07
	5·16	1·03	0·89	17·94
2. Clay and sand. . . . .	93·67	98·65	98·66*	79·02

\* On analysis by Schlesing's method, in soils 2 and 3, clay was not found.

To bind moving sands, they are usually planted with forest; but in southern localities, as at the mouths of the Dnieper, a successful attempt has been made to cultivate the vine, which here is not subject to the attacks of the phylloxera, upon such sands as are analysed above.

## 6. NORTHERN LANDS.

The soils of the northern, non-Chernoziom region of Russia cannot be brought under similar definite types. Here all possible soils are found, beginning with the heavy clay and ending with sand, including soils so rocky that their cultivation becomes possible only after the removal of the stone. It is evident, that the cause of this lies in the fact, that the moraine deposits of the glacier which existed here, either were subjected to no selection whatever, or the fine products of these deposits were carried away by water only to short distances. At intervals the soil is here composed of the deposits of older rocks transformed by weathering.

Compared with the soils of the southern regions, the northern soils are more coarsely granular, or at least in the majority of cases, contain a considerable admixture of coarse sand, gravel and pebbles of various sizes. Formerly, all this region was occupied by a continuous forest; whether there were, here and there, unwooded tracts, is hitherto unknown, but if so, which is little probable, they were of small extent, and exceptional. Therefore, the northern soils are distinguished from the southern by yet this important character, that in them there are in general very few organic substances, because they never accumulate in considerable quantity in forest soils. Their accumulation in this region occurred only here and there in valleys, where there was an excess of water; but organic substances under such circumstances, accumulate not in the substance of the original soil, but upon its surface, forming a sharply distinct layer of peat. The vegetable remains of such deposits usually preserve the structure of the plants from which they originated, as under water or when water-logged, they do not become disorganized by small animals. The deposits of turf in many places are exploited in exactly the same manner as the sands. Near rivers, in the northern region also, there are found soils equally unproductive with those above described.

Whatever the variety of the northern soils, there is a resemblance among them all in one respect: in consequence of the fact that they were all under forest, in their upper stratum similar alterations have taken place, clearly to be seen when the soil is first ploughed up after the felling of the forest. These changes consist in that almost all northern soils, to a greater or less extent, have the character of podzol or fuller's earth. Typical podzols, as their name implies, present a great resemblance in colour to ashes: they are of the same pale gray hue. On alteration podzol generally assumes a perfectly white colour, and when broken up, may be mistaken for chalk. Such soils, in northern Russia, bear the name of bielák or bielùn; in some places, they are called lúdá.

The most characteristic podzols consist ordinarily of very fine particles, like lösz, which are mainly quartz sand. The fineness of the particles is not, however, an invariable property of podzol, as such soils are found which consist of fairly coarse sand, or a large admixture thereof. The fine-grained quality of the soil retards the passage of podzol into ordinary earths, and therefore such soils preeminently bear the name of

podzols. On examination by the naked eye, it is impossible to detect in them especially in the white variety, any organic substances; but on washing with ammonia, the solution obtained, at first colourless, rapidly darkens in the air, and takes the deep brown colour characteristic of guminous substances, furnishing a proof that podzols contain crenic acid or its compounds, the alkaline salts of which easily oxidise in the air, forming apocrenic salts of a dark colour.

Thus, all northern soils were evidently subjected to the same changes as the gray forest lands in the Chernoziom zone, and in dependence upon the very same causes. The washing of the soils by aqueous solutions of crenic acid in the north proceeded, however, with greater energy, in consequence of the greater permeability of the northern soils for water, and of the lesser dryness of the northern climate. The results of the process are also here more pronounced, because the northern soils, from the very beginning, contained less zeolithic substances than the Chernoziom, so that even the process being the same, from northern soils a considerably greater proportion of them can be removed. The more thorough washing of the soil in the north is evinced in the more energetic change of the subsoil; in gray forest lands this action upon the upper layer led to the formation of a dense lumpy stratum at a certain depth; in the northern lands, instead of this there was formed a real alios, in places in the form of a continuous layer, in others, in the form of separate masses of various sizes; very often alios manifests itself only by a certain density of the deep layers of the soil.

In order to show the difference between podzol and the masses formed under it, the following analyses are given from the governments of Smolensk and Grodno.

	Smolensk.					Grodno.					
	Soil 1.		Soil 2		Masses under these.	Layer 1.		Layer 2.		Deeper.	Under these, alios.
	P	E	R	C		E	N	T	A	G	
Hygroscopic water . . . . .	1·79	0·83	3·16	2·42		0·45	0·31				0·91
Dry soil:											
Humus . . . . .	—	—	—	—		0·16	0·25				0·10
Chemically combined water . . . . .	—	—	—	—		0·18	0·44				1·54
Loss on ignition . . . . .	5·65	3·68	4·78	21·05		1·84	0·69				1·64
Mineral substances . . . . .	94·35	96·32	95·22	78·95		98·66	99·31				98·36
Of these:											
1. Zeolithic substances:											
Silica . . . . .	4·68	5·51	4·90	3·97		2·28	1·14				2·99
Alumina . . . . .	4·64	4·58	14·35	0·84		0·69	0·66				1·74
Oxide of iron . . . . .	0·11	0·04	0·08	0·04		0·26	0·34				0·73
" manganese . . . . .	0·22	0·25	0·16	0·32		0·06	0·05				0·02
Lime . . . . .	0·33	0·36	0·32	0·03		0·84	0·03				0·11
Magnesia . . . . .	0·20	0·23	0·30	0·07		0·02	0·02				0·12
Potash . . . . .	0·04	0·04	0·03	0·05		0·01	0·02				0·05
Soda . . . . .	0·12	0·08	0·81	0·12		0·05	0·03				0·05
Phosphoric acid . . . . .	0·01	0·01	tra	ces.							
2. Clay and sand. . . . .	10·35	11·10	20·15	5·75		3·42	2·30				5·98
	83·68	84·90	75·08	73·31		95·33	97·07				93·09

That such is the origin of podzol it is easy of demonstration in many cases. Thus, a forest is cleared and the field, sown several years in succession and then abandoned, once more becomes overgrown with wood. In such cases, the soil covered with forest is white or ashen gray; after being re-cleared and cultivated for some years it assumes the colour of ordinary clay soil, but on becoming again forest-grown it recovers its former hue. Examples are afforded in the soils from the government of Smolensk, indicated in the preceding table. Such changes take place much slower in soils little permeable to water. Such soils, even under forest, prove sometimes comparatively little changed; but, once the change has taken place, they very long retain the character of podzol. Washing with the solutions of crenic acid leads to their impoverishment in regard to zeolithic substances, and consequently diminishes their fertility. Typical podzols, as a matter of fact, are distinguished by an exceedingly small productiveness, even in such cases where they are formed from clayey lands. In the north-east of Russia, where the layer of podzol or, according to the local nomenclature, luda, was formed upon Permo-Triassic clays, the peasants have a truthful saying: "Where there is luda, there is want". After prolonged cultivation, and continual treatment with manure, podzol lands become more fruitful, and are capable of producing clover; upon podzols only just cleared from wood, clover grows very unsuccessfully, from the insufficiency in the soil of potash salts in a form suitable for the nourishment of plants. One of the characteristic peculiarities of podzols is the occurrence in them of phosphorus, many podzols containing a considerable quantity, but being found almost exclusively in the form of organic compounds, it is of little value to crops.

In consequence of the low fertility of the northern lands, they cannot be successfully sown without manuring; but on account of the thinness of the population, and the absence of good meadows and pastures, the number of cattle is insufficient, and hence animal manure is scarce. Therefore, in northern Russia, for the most part, arable lands form an insignificant part of the whole area. The employment of artificial manures has proved impossible, in consequence of the cheap prices prevailing for grain. Only lately has there been found a means for enlarging the area of cultivation without increasing the number of cattle: it has been learned that waste lands, ploughed up and dressed with raw phosphoritic flour, in the proportion of rather more than two pounds of phosphoric acid to the acre, yield very good crops of rye. The cultivation of clover, in like manner, proves very profitable if the soil be manured with kainite. The possibility of growing clover on podzols decides the question of supplying these lands with cheap nitrogen. These results have, however, been only lately achieved by Prof. Engelhardt, and the method indicated has not yet obtained wide application. As far as concerns the tillage of northern lands, to this problem are applicable all the rules recommended for Northern Germany.

## 7. VINEYARD SOILS OF THE CRIMEA AND THE CAUCASUS.

The foregoing refers to soils which are under cultivation and which occupy the whole plain of European Russia. In the extreme south of Russia, in the Crimea and the Caucasus, however, vine-culture is practised on soils unlike those described

above. Upon the southern shore of the Crimea vineyards are grown on soils composed of clay-slate of the Jurassic system. In some instances they are cultivated upon a dense unweathered schist, in which case the soil layer largely consists of stone fragments varying in size from one to six inches in diameter. But these pieces rapidly break down in the air, and at last form a compact clayey soil. In other cases use is made of clay already formed from the same schist, brought from the higher mountain slopes. In some places, to this clay is added carbonate of lime in a finely powdered state, likewise washed down from the mountains.

Schist, and the clay formed from it, also presents a soil very poor in all nutritive substances. It is particularly remarkable that in schist and in clay formed from it there is contained a quantity of oxide of iron, while phosphoric acid occurs in the form of phosphate of iron, and is therefore almost useless for plants. In argillaceous soils, on the other hand, with an admixture of carbonate of lime, nutritive substances are present in abundance, evidently in consequence of the weathering of the component parts of schist, under the influence of carbonate of lime. Such clays, in their chemical composition, are similar to lösz, and involuntarily lead to the surmise, that the well known fertility of lösz also is due to the fact that its constituents have suffered a strong weathering, in consequence of the presence in it of carbonate of lime. The annexed table may serve to confirm what has been stated.

	1.	2.	3.	4.	5.	6.	7.	8.		
	P	E	R	C	E	N	T	A	G	E.
Hygroscopic water . . . . .	1·78	0·40	2·51	2·52	2·12	3·38	2·30	3·64		
Humus . . . . .	0·69	0·31	0·60	0·74	0·50	1·28	0·64	1·78		
Chemically combined water . .	2·97	1·42	3·27	3·44	2·84	3·52	2·37	3·40		
Mineral substances . . . . .	94·79	98·14	94·23	93·24	94·59	91·96	94·91	90·84		
1. Zeolithic substances:										
Silica. . . . .	5·81	3·27	5·22	8·55	4·02	14·93	13·70	14·35		
Alumina . . . . .	4·30	2·28		5·55	8·58	4·10	6·61	4·69	7·08	
Oxide of iron . . . . .	1·40	1·00					7·73	8·81	6·51	
» manganese . . . . .	0·05	0·10	0·03	0·10	0·38	0·24	0·12	0·08		
Lime. . . . .	0·34	0·26	0·22	0·42	0·46	1·19	1·07	1·05		
Magnesia. . . . .	1·15	0·52	1·06	1·01	1·09	1·28	1·47	1·23		
Potash . . . . .	0·44	0·08	0·52	0·48	0·56	1·51	1·38	1·32		
Soda. . . . .	0·11	0·04	0·15	0·11	0·17	0·20	0·30	0·25		
Phosphoric acid. . . . .	0·13	0·07	0·12	0·12	0·13	0·09	0·11	0·10		
Sulphuric acid . . . . .	0·03	0·21	0·03	0·04	0·04	0·05	0·02	0·07		
	13·76	7·83	13·00	20·51	10·95	33·83	31·67	32·04		
2. Free oxide of iron . . . . .	4·20	5·26	4·12	2·25	6·25	—	—	—		
3. Carbonate of lime . . . . .	0·09	2·50	0·05	0·07	0·20	14·98	4·30	21·82		
» magnesia . . . . .	—	1·70	—	—	—	—	—	—		
4. Clay and sand . . . . .	76·74	80·85	77·06	70·41	77·19	43·15	58·94	36·98		

Numbers, 1 and 2, are unweathered schist; 3 and 4, schist long-planted with vines; 5, clay soil from schist; 6, 7, 8, clay soil from schist, mixed with carbonate of lime.

Along the northern shore of the Black Sea near the foot and upon the slopes of the Caucasus range, vineyards are grown, for the most part, on calcareous schist which, falling to pieces in the air, is hence called *treskùn*.

In Transcaucasia the soils under vineyards are exceedingly various: they usually present drifts from the mountains, and their composition depends upon the rocks which form the neighbouring mountains, and upon the rapidity of the torrents which cause the drifts. Sometimes they are similar in their characters to lösz, otherwise they consist of coarse rubble and shingle with a small quantity of fine earth; some of them contain a considerable quantity of carbonate of lime, while in others this substance hardly occurs.

In Daghestan, the soil under vineyards is mainly a lösz-like clay of great fertility. The annexed table shows the composition of soils from several vineyards of the Caucasus.

### Soil of Caucasian vineyards.

	1.	2.	3.	4.	5.	6.
	P E R C E N T A G E .					
Hygroscopic water . . . . .	0·04	0·57	2·94	3·08	5·89	4·48
Humus . . . . .	0·48	0·14	1·36	2·80	1·75	2·20
Chemically combined water . . . . .	2·37	2·91	2·76	3·62	2·95	4·21
Mineral substances. . . . .	96·21	96·38	92·94	90·50	89·41	89·11
1. Zeolithic substances:						
Silica . . . . .	4·74	1·67	17·55	14·92	14·91	17·32
Alumina . . . . .	0·66	1·15	7·30	10·59	9·90	7·02
Oxide of iron . . . . .	1·57	0·57	3·59	7·27	5·51	7·77
" manganese . . . . .			0·12	0·40	0·20	0·36
Lime. . . . .	0·33	0·14	0·51	0·35	0·81	0·83
Magnesia. . . . .	0·57	0·32	1·07	1·82	1·41	1·00
Potash . . . . .	0·38	0·19	1·00	1·03	1·16	1·44
Soda. . . . .	0·07	0·06	0·12	0·13	0·10	0·21
Phosphoric acid. . . . .	0·07	0·07	0·15	0·13	0·09	0·17
Sulphuric acid . . . . .	0·40	0·03	0·04	0·05	0·03	0·14
	8·79	4·32	31·74	36·40	34·28	35·79
2. Carbonate of lime. . . . .	61·83	80·93	11·41	0·45	3·20	9·59
" magnesia. . . . .	—	—	—	—	—	1·05
3. Clay and sand . . . . .	25·60	11·13	11·13	53·56	52·03	43·25

### PHOSPHORITE DEPOSITS.

Of fertilisers of mineral origin in Russia there occur only deposits of the phosphorites or coprolites in strata of different geological systems. Up to the present time there have been investigated, mainly, the following:

1. Podolian, along the banks of the Dniester. The phosphorites here occur in clayey schist of the Silurian system, in the form of regularly turned and polished cobbles. They consist of crystalline phosphate of lime and fluoride of calcium, in the same relation as in apatite, with a small proportion of carbonate of lime. The crystals in these lumps are placed radio-concentrically. Their average weight is a trifle more than a pound; their density reaches 2·8 to 3·0, while their hardness is almost equal to that of fluor-spar. These phosphorites are, of all those occurring in Russia, the richest in phosphoric acid. Moreover, in some cases the interior contains a quantity of carbonate of lime, and these nuggets show that phosphorites were formed by infiltration of phosphoric and hydrofluoric acids into a mass composed of carbonate of lime.

The composition of a few such nodules is expressed below:

	Outer.	Central.
Phosphate of lime . . . . .	79·70 per cent.	87·61 per cent.
Fluoride of calcium . . . . .	6·16 " "	7·29 " "
Carbonate of lime . . . . .	0·62 " "	0·61 " "
· · · · ·		
Phosphoric acid . . . . .	36·53 " "	40·42 " "

	Outer.	Medium.	Central.
Phosphate of lime . . . . .	82·66 per cent.	83·33 per cent.	53·70 per cent.
Fluoride of calcium . . . . .	6·72 " "	6·85 " "	4·58 " "
Carbonate of lime . . . . .	1·95 " "	5·27 " "	37·02 " "
· · · · ·			
Phosphoric acid . . . . .	37·89 " "	38·60 " "	25·56 " "

Flour prepared from such phosphorite contains, on an average, more than 30 per cent of phosphoric acid, but in consequence of the difficult solubility of crystalline phosphate of lime, flour from the Podolian phosphorites acts less strongly than that containing amorphous phosphate of lime.

2. The Central deposits are the most extensive. The phosphorites here occur in strata of the Cretaceous system, either in the form of irregular lumps composing one or two separate layers, or in that of a continuous stratum. Deposits of phosphorite of this kind occupy a vast unbroken area in the governments of Smolensk, Oriol, Kaluga, Kursk, Tambov, Voronezh and in some others.

The phosphorites of the Central deposits present an argillaceous sandstone cemented with phosphate of lime. The cement binding the sand contains everywhere about 30 per cent of phosphoric acid, so that the proportion of the latter is dependent upon that of the sand, as appears from the following examples:

Phosphorites:	1.	2.	3.	4.	5.
	P e r c e n t a g e s.				
Sand and clay . . .	25·87	57·10	53·70	48·25	9·15
Substances soluble in muriatic acid . . .	74·13	42·90	46·30	51·75	90·85
· · · · ·					
Phosphoric acid . . .	22·07	13·20	14·25	15·40	28·65

Phosphorites:	1.	2.	3.	4.	5.
	P e r c e n t a g e s .				
In soluble substances there is phosphoric acid . . . . .	29.77	30.76	30.79	29.75	31.53

Flour of these phosphorites, which has recently been brought into use as fertilizers, mainly in the non-Chernoziom governments, contains from 15 to 17 per cent of phosphoric acid.

3. Volga deposits in the governments of Kostroma and Yaroslav. Phosphorites in the form of irregular fragments occur in strata of the Jurassic system, and consist for the most part of phosphate and carbonate of lime, stained dark with organic substances. They are exceedingly rich in phosphoric acid, so that, in the flour prepared from them, 26 per cent of phosphoric acid is guaranteed, and usually it somewhat exceeds this normal. Phosphorites after preliminary roasting and cleaning from admixtures on the surface with other fragments, are easily ground into the finest powder, which exhibits an extremely powerful influence upon the fertility of the northern non-Chernoziom soils, not less in this respect than that made from the Thomas slags.

4. The Glauconite phosphorites of the Riazan government consist of grains of glauconite bound together with a cement composed of phosphate of lime. The proportion of phosphoric acid in them varies from 6 to 30 per cent, depending upon the quantity of glauconite. Seeing that this mineral contains potash, generally in the Riazan phosphorites from 1 to 4 per cent, these formations excited great hopes, as they were considered to be both a phosphatic and a potassic fertilizer. Till the present time, the value of glauconite has not been made out in practice, and the Riazan phosphorites have given no better results than those containing an equal quantity of phosphoric acid.

Various sorts of flour are in the market, with different proportions of phosphoric acid and glauconite.

Besides these chief sources, there are smaller deposits, and till now little investigated, in the governments of Viatka, Simbirsk, and some others.

Phosphorites, as has been said, are being applied in considerable and continually increasing quantities for manuring the fields, chiefly in the non-Chernoziom zone. Furthermore a part of the phosphorites obtained in Russia are sent abroad. During the past five years, the exports from Russia, of phosphorites chiefly to Austro-Hungary, were as follows:

Years.	Pounds.	Roubles.
1886	675,505	290,490
1887	468,794	202,825
1888	446,528	209,773
1889	521,126	295,569
1890	705,401	342,477

## CHAPTER III.

**Rural population and landed property.**

Distribution of the urban and rural population. Density of population. The cultivated area of Russia in relation to its whole surface. Distribution of the different kinds of land. Landed property as to extent and ownership. Forms of ownership: personal property, communal property, family-holdings, terms of tenancy and methods of farming.

**R**USSIA may justly be considered an agricultural country, for in no other civilized nation does the rural population predominate so decidedly over the urban. Even in the United States, which on the whole presents a considerable likeness to the great Eastern Empire, both in its comparatively sparse population and in the prevailing importance of agricultural pursuits over other branches of industry, the urban population is much greater in comparison to the rural, than is the case with Russia. The urban population of the United States in 1890 represented 29 per cent of the whole, whereas in Russia in 1885 hardly 13 per cent of its inhabitants lived in towns. The residents of towns and of the country in Russia were distributed in that year as follows:

P o p u l a t i o n .						
1. European Russia:	European Russia proper (50 governments) . . . . .	T o t a l .	T o w n .	C o u n t r y .		
				Per Cent.	Per Cent.	Per Cent.
	Poland (10 governments). . . . .	81,725,185	9,964,760	12·2	71,760,425	87·8
	Finland (8 governments). . . . .	7,960,304	2,125,458	26·7	5,834,846	73·8
	Total for European Russia. . . . .	2,176,421	191,620	8·1	1,984,801	91·8
		91,861,910	12,281,838	13·3	79,580,072	86·7
2. Asiatic Russia:						
	Siberia . . . . .	4,313,680	345,071	8·0	3,968,069	92·0
	Turkestan . . . . .	5,327,098	651,831	12·2	4,657,276	87·8
	Caucasus . . . . .	7,284,546	669,085	9·2	6,615,462	90·8
	Total for Asiatic Russia. . . . .	16,925,325	1,665,987	9·9	15,259,338	87·2
	Grand total for Empire. . . . .	108,787,235	13,947,825	12·8	94,839,410	87·2

At the present moment there are no less than 115,000,000 inhabitants in the whole Russian Empire.

The table shows that the greatest development of town life is reached in Poland, while Siberia and Finland are quite the reverse in this particular.

# DENSITY OF POPULATION

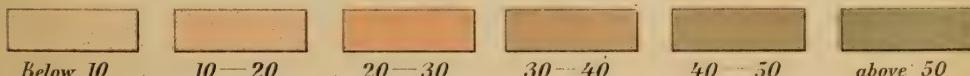
Chapter III. Rural population and landed property. Map No. 1



Del. by D. Semenov

Cartographical works A.Jlyne S.P.B.

Number of Inhabitants to 1 square kilometre.



*The figures on the Map show the number of inhabitants to 1 sq English mile.*



The population is distributed very unevenly over the whole of the Russian Empire, and the following table may give an idea of its density according to the great subdivisions of the Empire:

	P o p u l a t i o n .			
	Sq. verst.	Sq. kilo.	Sq. mile.	Sq. Eng. mile.
1. European Russia:				
European Russia proper . . .	19·3	16·9	945·7	43·9
Poland . . . . .	51·9	45·7	2,543·1	117·9
Finland . . . . .	7·6	6·7	372·4	17·3
Total for European Russia.	19·8	17·4	970·1	45·1
2. Asiatic Russia:				
Siberia. . . . .	0·4	0·4	19·6	0·9
Turkestan . . . . .	1·8	1·6	88·2	4·1
Caucasus. . . . .	17·9	15·9	887·1	41·1
Total for Asiatic Russia.	1·2	1·0	58·3	2·7
Grand total for Empire.	5·7	5·0	279·3	13·0

The accompanying map, № 1, gives a tolerably fair picture of the distribution of the population in European Russia. Roughly speaking for the Chernoziom district the south-western, Little Russia, and Central Chernoziom governments present the greatest density of population which is easily explained by the fact, that this region was the first to be inhabited and cultivated. It was already settled permanently in the days when the other parts of Russia were being continually overrun by nomadic tribes, and laid waste later on by the Tartars. Outside the boundary of the fertile Chernoziom district the most densely populated region is represented by Poland, and also by various parts of the Moscow Industrial region and the western provinces. This density is explained by the very same reasons that are just given for the Chernoziom district. The least densely populated parts of Russia are the northern regions, where the extreme severity of the climate renders all kinds of industry, save hunting and fishing, impracticable, and where agriculture in a few favourable districts is a pursuit of an altogether secondary character. This region resembles northern Canada both in its physical aspects and in its natural products, quite as much as the physical conditions of the south of Russia resemble those of Texas, or of any other southern state.

Asiatic Russia is very sparsely populated, with the sole exception of the fertile and artificially irrigated oases of Turkestan, with its ancient and original civilization. The Asiatic dominions of Russia may still be considered a huge reserve of free and fertile lands, and present a wide field of enterprise for emigrants from European Russia. This expanse of territory is the chief reason why to this day, and most probably for days to come, Russian emigration to America has played so small a part in the history of the colonization of the Western Republic in comparison with that of other European nations. It may be not out of place to mention here, that among the comparatively few emigrants to the United States coming from Russia, the non-Russian element vastly predominates. The bona fide Russians, namely, the Great, Little and White Russians, who are induced to seek their fortune away from their native homes, always prefer to settle on some virgin tract within the confines of their own immense country.

At the present moment more or less trustworthy data on the classification of the

various kinds of land, and on the distribution of the different forms of ownership and systems of cultivation, may be obtained for the fifty governments of European Russia, as here only a regular census of land-ownership is taken every five years.

The returns of a similar census, undertaken quite lately for the ten Polish governments, are not yet published, while a census for the Caucasus is only under contemplation. As to the other Asiatic dominions of the Empire no trustworthy census is possible for some time to come, owing to the centres of population being so far apart, and to the fact that most of its extent has not yet been surveyed.

The latest returns for the fifty governments of European Russia i. e., exclusive of Finland and Poland, having an aggregate population of 82,000,000, with regard to the general classification of the various kinds of lands, give the following results:

	Dessiatines.	Acres.	Per Cent.
Arable and fallow lands . . . . .	106,666,453	287,976,423	26·2
Meadow . . . . .	64,806,253	174,957,441	15·9
Forest . . . . .	157,616,608	425,517,556	38·8
Waste . . . . .	77,807,613	210,087,213	19·1
Total . . . . .	406,896,927	1,098,499,633	100·0

Such are the respective areas under forest, meadow, field and waste, the latter including roads and buildings, besides swamp, barren ground and rocks.

Gardens, as being included partly in waste and partly in arable and meadow lands, are not given under a separate heading.

The indicated proportions of the area of Russia, of course, vary greatly in different places. A good general idea of the distribution of various lands can be gathered from map № 5. While in some densely populated Chernoziom governments, as for instance in Kursk, the area of tillable lands reaches 75 per cent of the whole surface, and in some separate districts of the same government even 83 per cent and more; in the extreme north of Russia the relative extent of cultivated lands falls to 2·3 per cent of the whole area for Vologda, and even 0·1 per cent for Archangel. In short, the area of cultivated lands in proportion to the whole surface, as seen in map № 2, occupies more than half of the most densely populated parts of the Chernoziom region; rather less, from 20 to 40 per cent, in the parts of the same region and also in the densely populated parts of the non-Chernoziom district; and least of all, as is natural, in the extreme north of Russia. Forests on the other hand, as may be seen in map № 3, predominate in the northern parts of Russia, covering 86 per cent of the whole area of Vologda, and are still very plentiful in other tracts of the non-Chernoziom districts. In the Chernoziom district, on the other hand, they are now very scarce, being all but wanting on the steppes. Such is the case in Kherson, where the forest area is but 1·9 per cent of the whole surface, and falling to 1·2 per cent in Astrakhan. In some a further diminution of forest area is observed, where forests hardly cover 0·01 per cent of the surface. This scarcity of forests in the whole Chernoziom region and the wholesale and ever increasing destruction of trees, carried on for the purpose of extending the tracts suitable for cultivation, induced the Russian government to publish an Act, April 4, 1888, to provide a check to the transformation of forest into lands of any other description. This Act refers to the Chernoziom and some non-Chernoziom governments, and limits, to a certain extent, the absolute rights of forest-owners. In the south of Russia the government, not contenting itself with measures for encourag-

AREA OF CULTIVATED LANDS IN PERCENTAGE OF THE WHOLE SURFACE FOR EACH GOVERNMENT.

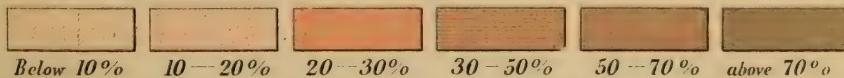
### Chapter III. Rural population and landed property Mag. N° 2.



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**Cartographical works A.Jlyne S.P.B.**

### Cultivated or arable lands cover



The figures on the Map show the area of cultivated lands in percentage of the whole surface of each government.

The shadowed parts show governments with waste land covering over 10% of the surface



ing the planting of forests, is actually concerned in raising trees on lands belonging to the State.

Meadow-land as compared to forest and arable land is more evenly distributed. It is most scarce in the densely populated parts of the Chernoziom region, covering from 10 to 15 per cent of the whole surface; the less inhabited steppe region on the other hand exhibits the greatest proportion of meadow-land running as high as 50 per cent. In the latter where the resting system of cultivation is followed, all land lying waste is naturally meadow, forests being very scarce.

Before giving a sketch of the present system of ownership of land prevalent in Russia, of the average size of different land properties, and of the distribution of land among the different classes of proprietors, it is necessary to give an idea, however rough, of the Russian classes themselves; and further, to define the most prominent features of the Great Act of Feb. 19, 1861, namely, the Emancipation of the Serfs, one of the noblest measures ever contemplated or realized by a Monarch. Now, as before the Emancipation, the Russian people are divided into five clearly defined classes: the nobility, clergy, merchants, burghers and peasants. Previous to the Act of 1873, which compelled every able-bodied subject of the Empire to serve for a certain limited time in the army, there existed a military class, which was made up of soldiers, their wives and families. Exclusive of these principal classes, there are some secondary divisions of the population, which generally bear a close resemblance to one or more of the classes mentioned above, such as the colonists, who are foreigners settled in Russia on lands allotted to them by the Government. They may rightly be classed under the name of peasants, both on account of the character of their pursuits and the nature of their rights and privileges.

The peasantry taken as a whole is a class that has practically always supported itself by agricultural pursuits. They were previously designated, according to the land they occupied, as State peasants, Crown peasants, and peasants belonging to private persons.

Previous to the Emancipation Act of 1861, all peasants were serfs of the State, the Crown, or of the nobility. The soldiers before the Act of 1873, being enrolled exclusively from the masses of the peasantry and burghers, on their release from service after a term of 25 years, did not return to their original condition of serfs, but served to form with their families the now extinct military class.

The serfs belonging to a private person lived on his land, and generally cultivated a part of the soil for their own special benefit and with their own implements. This part of the land, usually called the peasant lot, was the only means of their subsistence, and they were bound in return to till the remainder of the land belonging to their owner for his exclusive benefit, working under his orders. Although the law suffered the landowner to dispose of his peasants and their property as he might think fit, with the single reservation of providing for their well-being, still in most landed properties this system was in vogue, so that the peasants practically owned part of the land of their master and even sometimes the whole of it. The peasants even then enjoyed the vestiges of self-government, more of which hereafter. Thanks to this provision, the landlords seldom interfered in the personal or private affairs of their peasants, exerting their authority only in exacting from them a certain amount of work, which used to be performed under their own supervision. The so-called State and Crown peasants possessed a broader self-government; being personally free, they were still under the guardianship of the Department of Crown Lands and of the Ministry of State Domains.

The chief features of the Reform Act of February 19, 1861, are the following:

1. The liberation of the peasant from all personal dependence on the landowner, and the right of the communes to self-government in its broadest sense; certain traces and the general features of this self-government existed in the worst times of serfdom.

2. The obligatory redemption of the lands of the owners that were already practically on the lands, at least in the usufruct of the peasants before the Emancipation. These lands, portioned out to communes, but never to private individuals, are legally known under the name of peasant lots. These lots were not all immediately redeemed by the peasants, for according to a mutual agreement between themselves and their former owners, they were allowed the possession and use of the land for a certain annual rent. This land was apportioned to them by the Government and could not be expropriated or sold to others. All the peasants who formally belonged to the State were allowed to pay this temporary rent till the year 1885.

To realize this redemption of the peasant lands the Russian Government issued bonds to the landowners, representing the capitalized rent thereon. This debt was to be sunk by annual payments in a period of forty-nine years from the day of issue. In the year 1881, an Act was promulgated according to which those peasants who were still continuing to pay their annual rent for the tenure of land to their former landowners, were bound to commence redeeming it immediately. A similar Act for the State peasants was passed in the year 1885.

It is evident from the above, that all lands in Russia may be at present divided into: lands belonging to peasants, to the State, to the Crown, and to private owners. The private owners were mostly of the nobility, although even before the Emancipation a certain small quantity of land was in the hands of persons belonging to other classes. The latter were then allowed only to possess lands without serfs. After the Emancipation certain lands belonging formerly to nobles, passed into the hands of other classes, as could easily happen, since the difference between untenanted lands and lands peopled by serfs had ceased.

There is yet another class of lands, those belonging to the Church, which owe their origin to the practice of putting aside from twenty to seventy dessiatines to every church for the needs of the parish clergy. The Church lands taken altogether represent a very inconsiderable area of the whole. Lastly, should be mentioned the lands of monasteries and towns covering a still smaller surface. Some towns possess land outside their boundaries.

Map № 4 gives a tolerably good idea of the distribution of lands according to the various forms of ownership, showing particularly in what parts of the Empire the State lands are chiefly concentrated, and on the other hand where private lands predominate.

At present, land according to its various owners is distributed as follows:

	Dessiatines.	Acres.
Peasant lands . . . . .	131,372,457	354,666,222
State " . . . . .	150,409,977	406,061,815
Crown " . . . . .	7,367,740	19,890,688
Private " . . . . .	93,381,170	252,101,145
Church, monastery, town . . . . .	8,572,622	23,165,508

## PROPORTION OF FOREST IN PERCENTAGE OF THE WHOLE SURFACE ACCORDING TO GOVERNMENTS.

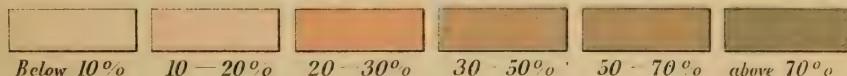
### ~~Chapter III. Rural population and landed property. Map N°3.~~



Del. by D. Semenov

Cartographical works A. Jlyne S.P.B.

### Forests cover.



The figures on the Map show forest area in percentage of the whole surface.



In the above table Finland, Poland, and the Don Region where all land belongs to the Cossacks, are excepted.

It is apparent that the largest owner of land is the State, more than a half of the rest belongs to the peasants, while private individuals own hardly the fourth part of the soil of European Russia. The peasant lands are distributed among about 11,000,000 families or agricultural units, averaging about thirty acres per family. The lands belonging to private owners, excepting 3,775,905 acres belonging to share-holding companies, are distributed in the following manner between owners of different classes:

	Owners.	Per cent.	Dessiatines.	Average.	Per cent.
Nobles . . . . .	114,716	23·8	73,163,744	637·8	79·8
Merchants . . . . .	12,630	2·6	9,793,961	775·4	10·7
Citizens . . . . .	58,004	12·1	1,909,603	32·9	2·1
Peasants . . . . .	273,007	56·7	5,005,824	18·0	5·5
Others . . . . .	22,934	4·8	1,732,713	75·5	1·9

This table shows that the largest quantity of private property is in the hands of the nobility, as could be expected from what has already been said, the merchants and peasants owning each an equal portion amounting to about one-tenth. The peasant lands, given here, represent the property that was obtained over and above their legal lots by private purchase. The nobles and merchants appear chiefly as the wealthier, the peasants and burghers, as the smaller owners.

It is an interesting fact that the average private property of the peasant is practically equal to the size of his lot; in other words, whenever the peasant wishes to extend his real estate by private purchase he buys nearly the same quantity of land, as granted to him by law. Although the property of nobles and merchants, as well as that of the peasants and burghers vary considerably in size, some being only fractions of a dessiatine and some, several hundred thousand acres; still the average size of the property for each class of owners, shown above, may be considered as typical of the greatest number of estates of that class, and corresponding to a certain system of farming. Owing to the differences in the cost, and in the fertility of land, and the greater or lesser density of the population, as can easily be ascertained after a careful consideration of the following facts, the average property for every class differs in size, according to its locality.

In the most densely populated and fertile parts of European Russia the average size of a nobleman's estate, or of any other class of property exclusive of peasant lands, varies from 1,600 to 2,700 acres. In the steppes this average reaches 2,700 to 5,400 acres, and in the northern regions 13,500 to 27,000 acres, and more. If the average size of private estates be considered according to districts, the variations will then be represented by 6·7 acres on the one hand, and 615,415 acres on the other, namely, in Perm. It is necessary however to mention that private landed property generally is very unevenly distributed in various places; thus, in some governments there is no private property worthy of mention, and all the land therefore belongs either to the peasant communes or to the State, as in Archangel, or in Viatka, where estates never existed during the regime of serfdom. In other parts of Russia, the peasant lots excepted, all the land belongs to private persons; in these governments there are no State lands.

Before considering the distribution of peasant lands proper, or lots, according to the various forms of ownership or size, it is necessary to understand the general conditions of communes or family-holdings of peasants, and also to determine the causes which effected this original form of land-tenure.

Serfdom or rather the condition of peasants, which is known in Russian by the term *k r e p o s t n o i e p r a v o*, the condition of bondage to the soil, as it appeared just before the Emancipation Act, was the outcome of gradual growth. The most oppressive epoch of serfdom prevailed in the middle of the last century, but even then certain traces of self-government remained, as a relic of happier times. The condition of the serfs was not the same in different places, which is accounted for by various historical and ethnographical reasons. European Russia consists in the first place of districts that form part of the Kingdom of Muscovy, and were peopled by the Great Russians; of districts inhabited by Little Russians, who remained temporarily under the Polish yoke, and comprised the Little Russian Hetmancy; of regions that constituted a part of the former Kingdom of Poland, and now peopled by Poles, White Russian and Lithuanians; of provinces that belonged to Sweden, namely Finland and the governments of the Baltic; and finally of such places as became settled after the transformation of the old Muscovite Kingdom into the present Russian Empire.

In the Kingdom of Muscovy, the Great Russians possessed a communal organisation and a communal right to the free use of the productions of the soil.

Communal affairs were discussed in assemblies of villagers possessing homesteads, and who were of age. These assemblies are called in Russian: Meetings of the Mir, or in short, "The Mir". Although the Little Russians possessed self-government to a certain degree, and even had meetings of their own, technically called Gromada, yet the commune itself, as understood by Russians, was totally wanting. In the former provinces of the Kingdom of Poland serfdom was developed to a great extent, at the time when it hardly existed in the Kingdom of Muscovy or in Little Russia. The fact that in some parts of that kingdom the peasants were of a different race from their masters, the former belonging either to the Lithuanians or to the White Russians, the latter consisting of Poles, or of Polonized natives, tended to make serfdom still more unbearable. Consequently in Poland, as also in the Baltic Provinces subjugated in the Middle Ages by the Livonian Knights, the original population were in a state of the most complete and distressing servitude, and were totally deprived of the ownership or even use of the land at a very early period. Vestiges of self-government in these parts of Russia are still to be found only in the White Russian villages; whereas, the Lithuanian, Lett and Estonian peasant lands are generally divided into single allotments separated one from another and never concentrated into villages. These allotments, formerly as now, belonged to single peasants. Most of the latter, however, are entirely without landed property, thus comprising a class of landless agriculturists, who hire their services both to the richer landowners and to their more fortunate brethren. The rural population of the old Kingdom of Muscovy consisted formerly of a number of perfectly separate, self-governed and independent communes. The peasants were free men, who settled on State and private lands. The wealthy lords of those barbarous times possessed, like those in other countries, servants, who were little better than slaves, being wholly dependent upon the will and pleasure of their superiors. These servants, called *k h o l o p y* or villeins, comprised a

# OWNERSHIP OF LAND.

Chapter III. Rural population and landed property. Map. N° 1

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Governments with State lands covering more than one-half of the surface.



Governments with Peasant lands covering more than one-half of the surface



Governments with Private lands covering more than one-half of the surface.



separate and by no means numerous class, totally distinct from the peasants proper. The rural communes in return for the right of tilling the land they held, used either to pay their rent in money, or oftener in natural products, or even bound themselves to work a certain number of hours a week for the benefit of the landlord. The land thus held by the peasants, was divided into *tiaglos*.

Every *tiaglo* empowered the owner of it to vote in the communal meeting as an independent member. A *tiaglo* presupposed the use of a definite and equivalent plot of ground, and the obligation of carrying out a definite and equal share of the communal burdens. The family of a peasant undertaking to carry out these burdens was obliged to consist of one adult labourer and one adult working woman, the possession of a horse being also requisite. This working unit was deemed essential for the proper cultivation of a plot of land corresponding to a *tiaglo*, and for the performance of any labour which might be exacted for cooperative work of the *Mir*, or for tilling the grounds of the landlord whenever the peasants were his tenants. This last obligatory work is called *barschina* in Russian.

This unit of course represented the minimum of labour required of a family. It happened, sometimes, that the head of a very large family undertook the responsibility of two or even three *tiaglos*. In case of inefficiency the commune had the right of depriving the peasant of his *tiaglo* and of giving it over to another. In some cases half-*tiaglos* used to be allowed, but never less. In sparsely populated districts where land was plentiful, nearly every commune, settled on State lands, could divide the virgin soil into new *tiaglos*, to be allotted to the applicant. Owners of private properties, the nobility and the monasteries, in order to derive as much profit as possible from the land, strove to increase the number of *tiaglos*, inducing the peasants to settle by giving them the necessary implements and even accomodating them with houses free of charge. It also lay in the interest of the communes settled on State lands to increase the number of their *tiaglos*, for the taxes were exacted from the whole commune in proportion to the land it possessed, and therefore the payment became easier as the number of *tiaglos* increased.

This order of things answered admirably to the requirements of agriculture so long as every *tiaglo* represented an indivisible agricultural unit, and so long as there were enough free tracts of land to provide for the necessities of the applicant. Until the end of the XVI century all peasants, even those who were burdened by the responsibilities of a *tiaglo*, were free to move from one part of the country to another. This freedom for the *tiaglo* peasant was however limited to the end of the agricultural year which fell on St-George day, in the spring. On that day every peasant had the right to leave his *tiaglo* and seek his fortune in other parts, leaving behind his house and his implements, which usually became the property of his landlord or of his former commune.

With the rise of the Muscovite Kingdom, its growing centralisation and importance, and the consequent necessity of increasing the taxes it exacted from its residents, the constant migrations of the peasants from one commune to another, performed often for the sole purpose of leaving their rents unpaid, rendered this order of things unprofitable to the Exchequer. Arrears became heavier every year, and complaints of the landlords and of the poorer communes continually increased. The poorer landlords and communes, who were unable to grant *tiaglos* on the same favourable conditions as the richer, were shunned by the peasants, and their lands became deserted. This caused

the Tsar Boris Godunov, in the beginning of the XVII century, to tie the peasants to the soil, in other words, to deprive the tiaglo peasants of their right of quitting their commune. This Act, according to which the peasants were bound to the land but not to the person of the lord, served as the basis of what Russians call *Krepostnoye Pravo*, Right of Serfdom. Although the provisions of this Act only concerned the tiaglo peasants themselves and in no way interfered with the rights of the members of their families to leave their communes whenever they pleased; still various abuses that crept in, the growth of the population, and consequently the increasing difficulty of securing tiaglos to new-comers, removed the difficulty by tying all peasants to the soil. It is evident that communes having no spare land were compelled periodically to parcel out their occupied lands afresh to suit the growing population. These new tiaglos became naturally smaller. Whenever the *Mir* which, until the Emancipation Act, 1861, was obliged to decide all questions by a unanimous vote, refused to permit a redistribution of the land, the half-tiaglo was substituted for the whole. In some cases where the surplus of the population could not find tiaglos for themselves, and who were loth to quit their homes, they became deprived of land, and were called the *bobyly* of the commune. If the commune happened to be settled on the land of a private person, these bobyly often became his personal slaves.

With the increase of population the demand for land increased; but landowners, who until the King Boris Act did all in their power to attract peasants to their estates, changed their tactics and imposed harder conditions on applicants. They judged rightly, that it would be much more profitable to cultivate their property by the help of their own tenants, than by appealing to strangers, who would have to be repaid by portioning out the very lands they wanted to keep for themselves. Therefore, two results became apparent: the commune, on the one hand, was driven to the necessity of frequently redistributing its land, on account of the claims which could not be overlooked to tiaglos of its adult and married members; on the other hand, the authority of the landlords became gradually more powerful and more absolute.

Still greater changes in the rights of the communes, and in the authority of the landlords, were effected by the poll-tax of Peter I. This tax was levied equally on every male peasant irrespective of age. In order to collect it a census of the whole male population of the country was taken at different times and at considerable intervals. In the case of the State peasants, the tax was levied on the commune according to the number of males; in the case of private serfs, it was paid by their master.

Naturally this measure, caused by the necessity of finding means for defraying the expenses of a long war with Sweden, resulted in many communes beginning to distribute their land not according to tiaglos or agricultural units as heretofore, but according to the number of males that paid the poll-tax. As a consequence the father of a large family of minors was often endowed with a much greater quantity of land than he could possibly cultivate without assistance; on the other hand, a family consisting of adult labourers often received a much less amount of land than would correspond to its working ability.

As for the landowners, the fact of their having to pay the taxes imposed upon all males living on their property and not on tiaglos, only strengthened their authority over their serfs, which amounted to their prohibiting the free withdrawal of any member of the family of a tiaglo peasant. Under these conditions the surplus popula-

# DISTRIBUTION OF DIFFERENT KINDS OF LAND

Chapter III. Rural population and landed property. Map N° 5.



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**Distribution of the surface; the prevailing kinds of land.**

**The prevailing kinds**

<b>Field lands</b>	[Orange Box]	Field, Meadow, Forest	<b>Forest lands</b>	[Dark Green Box]	Forest, Meadow, Field
	[Light Orange Box]	Field, Forest, Meadow		[Light Green Box]	Forest, Field, Meadow
<b>Meadow lands</b>	[Horizontal Stripes Box]	Meadow, Field, Forest		[Dotted Box]	Meadow, * Forest, Field
	[Dotted Box]	Meadow, * Forest, Field			

\* Steppes are counted under meadow.



tion had no lawful means of quitting their commune or their master, so that all emigration dating thence may be called illegal. Even if the thinly populated districts of the confines of Russia still continued to be freely colonized, the greater part of the settlers were run-away serfs. The extension of Russia and the annexation of new and thinly populated districts, as well as the growing density of the population within the confines of the old Muscovite Kingdom, necessitated emigration on a large scale. This was borne in mind by the Government which eventually permitted landlords possessing unpopulated lands to buy landless peasants, for the purpose of settling them on their waste lands, and the further right of transferring their own peasants from one property to another. At the same time the State began to transfer its own peasants from thickly to thinly populated districts, using much more discretion in this cruel transfer, than the private landowners. As a result of this measure the colonization of the steppe districts of Russia, hitherto a desolate waste, received a powerful impulse; but on the other hand serfdom at the same time reached its fullest development. The authority of the master over the person and the property of his peasant, joined with the power of purchasing serfs apart from the lands they occupied, was thus sanctioned by law. The authority of the landowner over his peasants increased to such an extent that the wives and daughters of the peasants were brought under his power, and as a natural result the sale of separate members of one family with the separation of children from their parents followed. According to the law, as it then stood, a girl who married became the property of her husband's master, and hence marriages between persons belonging to two different masters could be contracted only by special agreement. As a rule the girl was sold before her marriage to her future husband's master, and in most cases for a purely nominal sum. These sales, originally induced by the peasants themselves, became unfortunate precedents, in as much as the practice led their masters to separate members of a family without any humane reason.

In the former Kingdom of Poland and in Little Russia, the effects of these arbitrary proceedings were not so deeply felt, for they obtained nearly in the same form much earlier, as was mentioned above. Serfdom, growing more and more disastrous and severe, reached its fullest development at the end of the XVIII century and the beginning of the XIX. In the reign of Empress Catherine II slight attempts on the part of the Government to curtail the arbitrary power of the landowners, could already be detected. The Empress, strengthening the privileges of the nobility, at the same time ordered the properties of nobles who abused their authority to be given over to supervisory boards. This measure being seldom applied could do no permanent good. Later on, Emperor Nicholas I forbade the separation of families, and prohibited also the sale of peasants apart from the land they occupied. Thus at the end of his reign the landlords could only sell their peasants with their estates.

The great Reform of February 19, 1861, brought about by the Emperor Alexander II, finally liberated the peasants from their former masters and endowed them, with very few exceptions, with the lands they were occupying at the time; in certain cases, as in the western governments, the peasant lots were even augmented. In order to help the peasants in redeeming their property the Government established a certain scale of prices. Such a redemption was made obligatory in the year 1882. The poll-tax, finally repealed in 1885, was after the emancipation of the serfs, of course, levied on all peasants, whether they belonged formerly to private owners or to the State, on the same

conditions as, in the time of serfdom, obtained towards the State peasants. In endowing the peasants the Government established maximum and minimum lots differing in size in various localities, generally equivalent to the quantity of land they were allowed to occupy in the days of serfdom. In the distribution of land the male census of 1857 was taken into account, so that at the time of the Emancipation every male, irrespective of age, was provided with a definite amount.

The landowner, in cases where the peasant lots exceeded the maximum allowance, was permitted to keep the surplus to himself; on the other hand, the Government always provided the peasants with the land at the expense of the nobility whenever the lots were too small. The largest increase in the size of the peasant lots was in Poland. Here, very soon after the promulgation of the Emancipation Act the redemption of the peasant lot was rendered obligatory; the conditions imposed were made much lighter than anywhere else, the price of redemption was reduced, and the lots themselves considerably increased. In the other parts of the Empire the peasants were endowed with a quarter of the maximum lot, and this endowment was sanctioned by the Government whenever the land-owner and the peasant could come to a mutual agreement on the subject. This lot, being presented to the peasant, was called the donative or quarter allotment. A very few profited by the right to avail themselves of this gift, and they only in those parts of the country where the Government valuation of the legal lots was higher than the then existing values of lands on sale in the neighbourhood. Such peasants however, owing to a considerable rise in the value of land over all Russia, found themselves in a much worse condition than their neighbours, who received their entire maximum or minimum as the case might be.

Wherever before the Act a commune existed, it became legally acknowledged; whenever a commune was wanting, the land belonging to the peasants of the village was left in the hands of separate owners. Still the deeds to the lands were always delivered to whole communes or villages, and never to separate members; all the taxes were likewise levied on the whole commune, the members of which were usually bound by a mutual pledge to see that they were properly paid by the commune and by themselves. The distribution of taxes among the separate members of the commune, as well as the distribution of land in villages that retained their communal organisation, was unconditionally reserved to the decision of the Mir. These decisions, according to the provisions of the Act of February 19, 1861, cannot be appealed, if passed by two-thirds of all the members of the village, whenever a new distribution of land or taxes is effected. The two-thirds of the members as a rule represent the adult male population of the village. The land, where the communal use of it has been retained, is as a rule equally distributed among the male population of the village, irrespective of age. In some communes it is redistributed at definite or indefinite intervals of five to twelve years, according to the change in the number of the male population; in others, on the contrary, such a redistribution has been seldom if ever made since the Emancipation Act.

Such are the proceedings of the commune in most cases; but there still exist villages where land is divided into tiaglos\*; although the tiaglo has not at present

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\* The term tiaglo (тиагло, lit. burden), originally represented a definite part of those burdens or taxes which fell on every member of the commune, but as the taxes corresponded to a certain quantity of land, this term was used to define it.

preserved its ancient character of a convenient and indivisible farming unit, it simply corresponds to the portion of every adult peasant. The land is therefore divided according to the grown-up labourers of a family. Occasionally villages are to be found where the land is distributed according to the number of males and females, irrespective of age. In very rare cases some of the land is left undivided among the members of the commune, and is cultivated by all the villagers, the products of such land sometimes being divided among them, but oftener going to meet the payment of taxes or other communal expenses. Such lands are called communal farms. As a rule communal affairs are regulated by Common law, with certain exceptions arising from the varying economic and local causes, and from personal interests.

It is evident that under this system every plot of ground excepting yards and gardens is only in the temporary use of the same family and may be transferred to other hands by the arbitrary decision of the Mir. But this continual interchange of land, and which is the cause of the constant obloquies heaped on the head of communes as presenting the worst form of ownership from the point of view of the agriculturist, is by no means confined to communal villages, for this system is found in villages where every homestead is entitled to its own plots of ground. Many other inadequacies constraining the freedom of single peasant proprietors exist both in communal and non-communal villages.

The Baltic and other western provinces excepted, where farming is the prevailing system of land tenure, the villages both of Russian peasants and colonists in the south and south-east attain considerable dimensions. Speaking generally, especially for the Chernoziom region, villages and consequently village communes rarely consist of more than thirty homesteads with 100 to 200 inhabitants. On the contrary, usually the population of a single village largely exceeds that number, often counting 3,000 persons; in some cases they contain even 25,000 inhabitants. The lands belonging to such villages naturally cover an extensive area, the confines of which often extend tens of versts from the village. Even if in such cases the peasant lot does not exceed two or three dessiatines, the usual area for densely populated districts, the land belonging to large villages would measure from 5,000 to 25,000 dessiatines.

If the exigencies of the rotation of crops and of the distribution of land according to its different kinds, as meadow, forest, arable, fallow and pasture lands, are taken into account, such an extensive tract would present one large agricultural unit; consequently every peasant must have several plots of ground, one for each kind of land. To this must be added the unequal economic value of the property dependent upon its distance from the village, thus necessitating the distribution of all such unequal tracts among the members of the commune. The result is obvious. The peasant, whether he be a member of a commune or not, possesses a quantity of separate plots of heterogeneous land, scattered sometimes over different parts of a large surface, and is further prevented from doing what he likes with it. Thus he cannot radically change his system of crop-rotation unless it be decided by the Mir that the other peasants of his village adopt the same system. The Mir also can redistribute the lots of separate peasants whenever it may think it necessary for the welfare of the commune. Thus the difference between the communal and non-communal system of land tenure becomes much less than might be supposed at first. Re-division and re-distribution of the land may be effected alike in villages with communal or homestead lots, with the sole difference, that whereas in the first

case the Mir may change the original quantity of land used by a family, while in the second, the amount in the hands of a separate owner cannot be altered. All that has been said above of communal lots and homestead lands refers only to arable property.

Nearly every village of course possesses land that belongs equally to all the peasants, such as pastures for the village cattle, and other fallows. Forests and meadows, if any, are not common property; but timber and hay, gathered in common, are usually distributed among all the hands. Sometimes forests and meadows are portioned out to separate peasants, who in that case they collect the timber and hay for their own profit.

This system becoming more and more inadequate to the requirements of the agricultural class, with the diminution of the lots reserved for separate families on account of the increase of the population, will doubtless call forth new measures from the part of the Government. As a palliative against this extensive diminution of the size of peasant lots, a State Peasant bank was established in the year 1883. It facilitated the purchase of land for the peasants by advancing them money, at the same time mortgaging the land as a security. At the same time the Ministries of the Interior and of the State Domains inaugurated measures for the regulation and encouragement of emigration into unoccupied State lands. The extension of peasant lands, however, at the expense of private property will never become considerable for the sole reason that peasant lands are now in proportion to those of private owners as  $1\frac{1}{2}$  lots to 1; as to emigration, it constitutes but a fraction of the natural annual increase of the population, which exceeds 1,000,000 now.

In books, and among educated men well-versed in the problems of peasant farming and its future, various theoretical opinions are quoted on this serious question, yet hardly ripe for solution. Some think that the commune must fall and that the peasant lots must finally assume one of the forms of private ownership; others, that indivisible and inalienable family plots of land should be formed; while still others expect the people to develop a new form of land tenure that will answer to the new conditions of economic agriculture, such as common farming. Finally, some persons think that the people could not do better than to continue their ancient form of indivisible tiaglos. In retaining this form of land-tenure the Russian peasant will not be obliged to alter radically his mode of life and old customs, and will still possess his communal organisation and self-government; on the other hand, from a purely agricultural point of view, the tiaglo does not differ from the highly convenient indivisible farm of Western Europe. In any case the surplus of the population will either emigrate to new lands, or seek occupation and the means of subsistence in other pursuits than the tillage of the soil. As has been already said, the Government, endowing the peasants with land, has facilitated its redemption by extending to them the payment of interest and capital for a term of forty-nine years. This debt of the peasants has deprived them of the possibility of selling or mortgaging it. Thus, excepting the very rare cases of the liquidation of the debt before its expiration, the peasant lands have ceased to be alienable.

To prevent the possibility of the transition of peasant lands into other hands after the liquidation of the land-debt (a very unwished for contingency if the importance of the fact of most of the population being provided with land be taken into account), a new measure is being enacted for rendering the peasant lands inalienable for all time to come, even after the extinction of the debt on the land. Such are the features of the ownership and use of land by the peasant in the greatest part

of European Russia. In the Baltic provinces they assume a somewhat different form. There the peasants were emancipated rather earlier than in the other parts of Russia, and were liberated without any land endowment whatever. Some became landless labourers or *batraks*, others became farmers of certain plots of ground on the properties of nobles. These plots were formed out of the land that was allotted on all properties to the peasants. This land, called in German, *Bauerland*, and corresponding to the peasant endowments in other parts of Russia, cannot be incorporated in the other parts of the property and must be leased to separate peasant farmers, the scale of the rent and of the redemption money being determined by a special agreement between the landlord and the farmer. The maximum and minimum extent of every such plot, even after its redemption and transition into the hands of the peasant, is defined. The subdivision of such separate peasant plots cannot exceed the minimum, and on the other hand the maximum cannot be surpassed in the case of an accumulation of a number of such plots into the hands of a peasant. Of the grand total of peasant lands in the fifty governments of European Russia (the lands belonging to the Cossacks being excepted, as also lands belonging to semi-barbarous tribes in the east of Russia, which enter into the general total of peasants lands shown above), 80,159,386 dessiatines belonged to communes, and 22,260,308 to villages conducted on the homestead principle, the proportions being as 8 to 1. The communal lands were distributed among 6,387,289 families, each averaging 3·6 males; every family had thus on the average 12·5 dessiatines or 33·8 acres; the homestead lands were divided among 1,874,840 families, averaging each 3·7 males, and every family possessing on the average about 11·9 dessiatines or 3·1 acres.

In speaking of the history of the Russian peasantry and their relation to the nobles, it has already been pointed out in what parts of the Empire this or that form of land-tenure is now prevalent. The size of peasant lots vary according to different places; they are larger in sparsely populated districts and where the price of land is low, and vice versa.

The picture of the geographical distribution of peasant endowments, according to the size of lots, in comparison with the lot of the males or families, in its general features resembles that of the distribution of private property, with the difference that the maximum and minimum limits are not far apart. According to the provisions of the Emancipation Act of 1861, the maximum sizes of former private peasant lots fluctuated between 6·8 acres and 40 acres. Practically most of the lots did not attain these figures, but were, however, not much below them; some of the communes, as was stated above, were endowed with very small "quarter" or "donation" grants.

The former State and Crown peasants nearly everywhere received endowments double the size of those of the private peasants. In the following table the peasant lands are grouped according to their various kinds and to the sizes of the lots; the number of males at the time of the Emancipation Act, 1861, is also given. This table shows that the greater number of peasants received lots varying from 2 to 7 dessiatines; there are comparatively few lots outside of these limits.

Such was the original distribution; since then the population has greatly increased, and consequently the size of each lot has diminished; the differences in size in separate villages have become less, because according to statistical data, the increase of the population was more considerable where the lots were originally larger. As to the dis-

## Sizes of peasant lots granted to the male

	Less than 1 dessiatine.			From 1 to 2 dessiatine. (2·7—5·4 acres).		
	Number of males, accord- ing to the census.	Land in their posses- sion.		Number of males accord- ing to the census.	Land in their posses- sion.	
		Dess.	Acres.		Dess.	Acres.
Peasants belonging formerly to private persons . . . . .	565,310	362,940	979,938	1,358,929	2,167,899	5,853,327
Former State peasants . . . . .	97,839	63,210	170,667	334,282	533,893	1,441,511
Former Crown peasants . . . . .	3,439	2,508	6,772	24,060	36,389	98,250
Total . . . . .	666,558	428,658	1,157,277	1,717,271	2,738,181	7,393,088
Per Cent . . . . .	2·9	0·4		7·6	2·4	

	From 5—7 dess. (13·5—18·9 acres).			From 7—10 dess. (18·9—27·0 acres).		
	Number of males, accord- ing to the census.	Land in their posses- sion.		Number of males accord- ing to the census.	Land in their posses- sion.	
		Dess.	Acres.		Dess.	Acres.
Peasants belonging formerly to private persons . . . . .	1,057,312	6,117,008	16,515,922	263,211	2,142,440	5,784,588
Former State peasants . . . . .	2,784,511	16,451,788	44,419,828	1,882,454	15,535,145	41,944,892
Former Crown peasants . . . . .	222,821	1,339,628	3,616,996	81,017	647,184	1,747,397
Total . . . . .	4,064,644	23,908,424	64,552,446	2,226,682	18,324,769	49,476,877
Per Cent . . . . .	18·1	20·5		9·8	15·7	

opulation irrespective of age in 1861.

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From 2 to 3 dessiatines.  
(5·4—7·1 acres).

From 3 to 4 dessiatines.  
(7·1 10·8 acres).

From 4 to 5 dessiatines.  
(10·8—13·5 acres).

Number of males according to the census.	Land in their possession.		Number of males, according to the census.	Land in their possession.		Number of males, according to the census.	Land in their possession.	
	Dess.	Acres.		Dess.	Acres.		Dess.	Acres.
2,910,079	7,525,930	20,320,011	2,782,047	9,928,220	26,806,194	1,731,715	7,770,129	20,979,348
897,568	2,326,230	6,280,821	1,615,502	5,726,136	15,460,567	1,746,212	7,887,186	21,295,402
88,921	236,667	639,001	262,353	954,567	2,563,831	198,770	894,280	2,414,556
3,896,568	10,088,827	27,239,833	4,659,902	16,603,923	44,830,592	3,676,697	16,551,595	44,689,306
17·4	8·6		20·8	14·2		16·8	14·1	

From 10—15 dess.  
(27·0—40·5 acres).

More than 15 dess.  
(more than 40·5 acres).

T O T A L.

Average size of peasant lots.

Number of males, according to the census.	Land in their possession.		Number of males, according to the census.	Land in their possession.		Number of males, according to the census.	Land in their possession.		Dess.	Acres.
	Dess.	Acres.		Dess.	Acres.		Dess.	Acres.		
66,046	772,725	2,086,358	15,196	296,185	799,700	10,749,845	37,083,476	100,125,385	3·45	9·31
300,280	9,720,004	26,244,011	587,090	17,194,526	46,425,224	10,745,738	75,438,118	203,682,923	7·02	18·95
16,876	184,485	498,110	2,229	42,553	114,893	900,486	4,333,261	11,699,805	4·81	12·99
883,202	10,677,214	28,828,479	604,515	17,533,264	47,339,817	22,396,069	116,854,855	315,508,123	5·22	14·09
3·9	9·1		2·7	15·0		100	100			

tribution of peasant endowments according to the various kinds of land, it should be mentioned, that the proportion of arable land is much more considerable than on private property, not mentioning State and Crown lands. The cultivated land of the peasants for fifty governments of European Russia reach 60·1 per cent, private individuals owning but 31·3 per cent of arable in proportion to their other lands. In different governments cultivated lands occupy from 23 per cent to 82 per cent of the property of the peasants. Forests belonging to peasants are scarce and represent 11·4 per cent of all their property; meadows and pastures cover 24·4 per cent of the land belonging to peasants, and this relation is nearly the same on private estates. The size of peasant lots, especially of those that belonged to private owners, was never so large as to deprive them of earning money elsewhere. The *barschina*, mentioned above, represented such work in the times of serfdom and was chiefly the gratuitous cultivation of the master's land. This labour was in payment to the owner for the land the peasant used.

On the emancipation of the serfs, the landowners, as already mentioned, received the redemption money from the Government *en bloc*, the peasants beginning yearly to pay the interest and capital thereon. Labour became perfectly free. Landlords since then have been obliged to hire labourers for wages, and the peasants on the other hand offer their services for a certain amount of money. They are thus compelled to resort to work away from their homes in order to be able to pay their taxes with the least possible burdens on the proceeds of their own farms. As a rule the cultivation of the soil whether belonging to private individuals, to the State, or to themselves, both before and after the Emancipation Act, is performed chiefly by the peasants.

The peasants over all Russia, with the exception of the Baltic provinces, Poland, some western governments and Finland, are landed proprietors. The cases of peasants deprived of land are extremely rare. Even residents of towns, artisans and labourers in factories and work-shops, and domestic servants, nearly all possess land in some far off village. This unique feature of the Russian peasant has its advantages and disadvantages which nearly counterbalance each other. Owing to this circumstance Russia is delivered from those homeless labourers that afford a constant source of anxiety to other European governments. In Russia the difficult labour question with the great animosity between the workman and the capitalist, does not exist, or speaking more exactly, exists in a very small degree.

The majority of the masses are occupied in tilling the soil, both for themselves and for others; the minority working far from their homes in towns and cities, can always in bad times return to their paternal roofs, there probably to suffer from want. This want arises from the fact that the peasants working in towns generally represent the surplus of the population, and therefore unable to subsist for any length of time in the country. It is remarkable that the peasant generally appreciates his connection with the village. Giving over temporarily his lot to the care of his parents or neighbours, he goes to seek his living elsewhere and even after having gained a good position in a town, seldom leaves his native commune; he generally continues to bear his share in the payment of dues, and in case of success helps his relatives left in the village; from time to time he visits them, and in case of failure, often returns to resume permanently his native pursuits. Frequent cases of enriched peasants are to be found, who become merchants, acquire considerable fortunes, become house-owners in cities,

even millionaires, and still persist in being members of their original communes. Some of such persons are in the habit of repeating: "Everything I have amassed may be lost to myself and my children, but I shall still possess my lot, however small, and which nobody can take from me". In consequence of such motives the peasant very seldom breaks his connection with his native village and is driven to that extreme course only when he emigrates to some distant part of his country.

But there is an unfavourable side to the endowment of most of the peasants with land and to the strong ties that bind them to it. This condition of things prevents the Russians from attaining that degree of skill in labour that is reached in other countries, for the simple reason that most artizans are at the same time farmers. This state of things is due to the severe climate of Russia. During the long winter, three-quarters of the agricultural population are left without work, or are obliged to follow other pursuits. As a consequence there are many large villages and provincial towns in Russia where factories and other industrial enterprises are either shut during the summer months, or keep a very limited number of workmen. This fact is a draw-back to the rapid development of manufacturing industries, and may be considered as the chief reason for the comparatively slow growth of towns. Moreover, the rural population is often necessarily detained in the country in such numbers, that the communal lands and even the neighbouring estates cannot support them. For this reason individual peasants are often found in a state of extreme want, without horses or implements of any kind, and who find it more profitable to hire horses and tools with which to cultivate the pitiable lots that fall to them. Such peasants are often found in worse condition than the landless labourer himself.

All these facts necessarily exert a great influence on the very essence of Russian life, both in the country and in the town. At least half of the urban population are peasants coming and going, seeking and losing occupation.

If the various systems of farming be taken into account, it will be possible to determine a certain relation in any part of the country between the amount of its arable lands and the number of labourers necessary for its cultivation. This relation may be found by determining the amount of fieldwork, done at a stated time of the year. As the proportion of the adult labourers to the total population in any part of European Russia is the same, it will be easy to judge in any given district, to what extent the rural population corresponds to the total area of lands under cultivation.

Under the existing methods of farming in Russia it may be stated that an average area of  $1\frac{1}{6}$  dessiatines to every inhabitant expresses the normal relation between the number of labourers and the quantity of land. Starting from this fact, it is possible to determine approximately the scarcity or the superabundance of hands for every given place in Russia necessary for the requirements of agriculture under certain conditions. An excess of labourers may arise, even in very sparsely populated regions, whenever the proportion of arable lands to the whole district is very small. On the other hand in densely populated regions a deficiency in labourers may occur in such places, where improved systems of farming prevail. As a confirmation of this fact, in some districts of Russia, especially in the more densely populated Chernoziom and in most parts of the Industrial and non-Chernoziom regions, there is found a superabundance of labourers who are driven to seek occupation elsewhere. The peasants of the Chernoziom regions generally go to the south and the south-east of Russia to work in

the fields, whereas those of the Industrial region usually find occupation in towns. In some very rare cases, for example, on the confines of the densely populated parts of the Chernoziom region and in those non-Chernoziom governments where the industrial pursuits are not followed, the local population nearly corresponds to the necessary quantity of tillable property. Finally, vast expanses of territory in that great portion of Russia which is situated in the south and south-east can only be cultivated by the temporary influx of labourers from other parts.

It should be remembered that various stages of farming require an unequal number of hands at different times of the year. In Russia, owing to the long winter and to the great uniformity in the principal crops and likewise to the rapid and almost simultaneous ripening of the grain throughout the Chernoziom region, this irregularity in the distribution of field labour according to the different seasons of the year is sometimes very considerable. The most difficult season is harvest-time, which is called in Russian *strada*, from the verb *stradat* which means to suffer.

As has been mentioned, private lands are chiefly cultivated by the peasants living in the neighbourhood or coming from afar. Under such conditions, and under divers other local peculiarities, arose many methods of securing hand-labour, and of farming in Russia, some of which are altogether unknown in other countries. Only in Russia, perhaps, can be found land-owners who would undertake to cultivate other people's property. Where there is a sufficient number of labourers for the cultivation of all the available land most of the private farms are tilled by the local peasantry, by the help of their teams and tools. Such a form of cultivation, either as *barschchina* or tenancy for rent, was almost universally practised in Russia before the Emancipation Act. Since that time it assumed the following chief features:

1. *Izdielnyi nayom*, literally, hire for a definite amount of work in return for payment in natural products, instead of money. Peasants are hired to perform certain special work, as ploughing, harrowing, sowing, reaping, or growing and harvesting whole dessiatines for money, or for the right to sow a certain amount of land for their own benefit. In giving over to the peasant such a field for the purpose of cultivation the landlord generally states his terms in the beginning of the preceding winter, and at the same time gives hand money thereon. Under the terms, a thorough cultivation of the soil is required, namely ploughing it twice or three times over with the *sokha*, sowing the seed of the landowner, harrowing or covering of the seed, and harvesting. Threshing is generally not included in the terms, and is done by day-labourers, or by machinery. In case the work is not for money, but for land, the peasant is entitled to sow for his own benefit and with his own seed one dessiatine of the landlord's land for every two he cultivates for the owner.

2. Another form of agricultural labour bears a close relation to the preceding and is very much practised on private lands in some parts of Russia, and consists in the peasant performing a certain work, in return for a share of the harvest. This system of land-culture is very profitable to the proprietor for the simple reason that he risks nothing, and is not obliged to expend anything. Even in case of a very bad harvest and low prices it rarely happens that the profits derived from the land do not exceed the expenses of cultivation, unless indeed the harvest totally fails. It should be added that the peasant whose earnings depend entirely on the harvest, is of course in-

terested in the proper cultivation of the soil, and consequently the proprietor generally superintends the work only during the time of harvest and the division of the yield.

3. The third form of farming private lands is by leasehold either en bloc to whole communes or companies of peasants for a long term, or in separate dessiatines to single peasants by the year. Instances of leasing for a long term to single peasants are rare, in which case the property must then answer to two conditions: it must either be very small, or suitably divided into a number of separate farms. Sometimes whole properties are leased to individual peasants, but in such cases the leaseholder, even if a neighbour, cannot cultivate the land with the help of his own family, and is obliged to hire others, as the proprietor himself would have to do.

4. The fourth and last form of farming consist in hiring workmen by the year or season. This system of farming prevails whenever there is a scarcity in local hands, especially in the southern and south-eastern steppe regions. Here summer and monthly labourers are especially numerous, who mostly come from other parts of Russia. The yearly workmen, here as everywhere else, are chiefly local.

One or the other form of farming private properties prevails in various parts of the Empire, but never dominates. Nearly everywhere all these forms are met with. Generally proprietors have recourse to more than one form of supplying themselves with labourers. Nearly in every landed property there is a certain number of landless peasants who work with the help of the proprietor's horses and implements; a part of the property is ceded to peasants in return for their cultivating another part of the owner's land, and yet other parts are tilled and harvested by other peasants for money or a certain share of the harvest. In case of necessity day labourers are occasionally hired and minor work is often performed for a certain consideration. Finally, a whole village commune may be contracted to perform certain work, in return for the use of some kind of land belonging to the proprietor; for instance, the members of the commune acquire the right to let their cattle graze on the proprietor's pastures or fallows, in return for which such members are obliged to haul manure and scatter it over the fields, or to mow a certain quantity of grass. Nearly every landowner possesses teams and agricultural implements, but seldom enough for his own use, in which case he hires from the peasants. Of course, on properties that are leased to peasants for long terms, no teams are absolutely necessary to the proprietors; such is also the case when the estate is farmed on shares. It should be added that more teams and implements are requisite on properties where agricultural labour is performed by workmen from afar.

In the Baltic, western and Polish governments are often to be found private lands, cultivated exclusively by batraks who live on the estate the whole year round, and in such numbers as are sufficient to perform all the necessary work; such estates can very seldom be found in other parts of European Russia. This is easily explained by the fact that the batraks must be fed the entire year, and on an average estate there is not enough profitable work for such a number of men during the winter months; in consequence of which, in purely agricultural districts, the demand for labour in winter is so small that a workman hired by the year receives practically the same as one who is employed only for the summer months.

## CHAPTER IV.

**Systems of agriculture and field-rotation.**

General characteristics of the natural and economic conditions of Russian rural economy; systems of forestry and field-cultivation in Russia, and the conditions of their existence in different localities; rotation of crops; grass-sowing.

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**N**O TWITHSTANDING the immensity of the Russian Empire, it presents through all its area several general features of climate which have an important bearing upon the development of its rural economy, and especially upon farming. These features are: a continental climate, severe winters, extremely high temperature during summer, rapid change of seasons, and lastly, in the south and south-east of the Empire, a very unequal distribution of moisture, want of rain or droughts, in spring and summer: that is to say, just at the time when all vegetation mostly needs moisture it suffers most from want of it.

In reference to its soil Russia may be divided into two unequal portions, strongly differing from each other; one of these is a tract of vegetable earth or mould, known as b l a c k - l a n d s (Chernoziom); while the other is distinguished by almost opposite characteristics. The boundary line between these passes from south-west to north-east and serves at the same time as a natural border between two agricultural regions totally different from each other in many respects. Within the limits of these regions, the less sharp differences in the character of the soils (clayey, sandy, ashy, etc., in the north; clayish, sandy and more or less rich mould in the south), influence the forms of rural economy in a less degree than the economical and climatic conditions of the districts, calling forth only such changes in the systems of cultivation as enter into the limits of technical agriculture, not influencing in the least the system of agriculture itself.

As a much more powerful agent, after the climate, influencing the general order and direction of the agricultural activity in different parts of Russia, appears the economical character of those parts which in their turn are influenced by different elements: for example, the density of the population; the proportion of the town population to that of the country; the distances from the chief buying-stations; the conveniences of the means of communication; the conditions and forms of land-ownership; and the more or less sufficient quantity of land allotted to the peasants.

It is known that in European Russia the most densely populated portions, corresponding to the average population of the West of Europe, stretch in a bow-shaped line, broader in its western parts, from Moscow through Kursk, Kiev and Warsaw. From this line on both sides the population thins more or less rapidly and reaches the smallest proportions in the far north, on the other side of the Volga and on the Caspian plains. As regards the ratio of the rural population to that of the town, it is impossible not to notice that in all the Empire, with the exception of its western borders and those governments which contain the chief centres of population, as St-Petersburg, Moscow, Odessa, Kharkov and Kiev, the percentage of town population is comparatively very insignificant. In all the other portions the rural inhabitants not only form a most important part of the population in general, but even in many cases, part of the town population closely approaches the rural in the nature of its occupation. So, there are towns which own very considerable tracts of land given up to agriculture, and a great part of the town population earn their living in this way. True, there are districts, for instance, in the central industrial region — in the governments of Moscow, Nizhni-Novgorod, part of Kaluga, Riazan, Yaroslav, Kostroma and others, where part, and in some places a very considerable part, of the rural population have almost given up agriculture and seek to earn their living partly by different branches of industry, partly by leaving their homes and following various professions elsewhere. But almost nowhere, except in the government of Vladimir and in some parts of the governments of Moscow and Nizhni-Novgorod, does the tendency of the population to occupations other than agricultural pursuits effect the general order of rural economy; only in these few districts does the agricultural industry occupy a second place in the rural economy of the people. True, there are other parts of Russia, where, with the same preponderance of the rural population over that of the town, a considerable number of the people earn their living otherwise than by agriculture; in the districts in the north of Russia, for example, there are conditions unfavourable to the development of agriculture, where even at the best it is impossible to sustain the people on the products of the soil and where the peasants live chiefly by various branches of forest industry such as lumbering, manufacture of charcoal and of tar, fishing and hunting.

The same arguments obtain with reference to the Azov steppes, in the regions of the lower parts of the Don and Volga, and the valleys and lowlands of the northern Caucasus where until the present day the chief industry is cattle-raising. But on the whole, however, this does not change what has been said concerning the character of the occupations of the rural population and of their resources and development; if in these places, the people do not live by agriculture, they are nevertheless sustained by the fruits of the soil. Only a comparatively small part of the population, in the far north on the shores of the White Sea and the Arctic Ocean, and also in the south on the shores of the Caspian, Black and Azov seas, and in the east in the region of the mining districts, live by other occupations, as for example, by fishing and hunting along the sea-shores, or by hand labor, in the mines and foundries.

Undoubtedly, one of the reasons which bind nearly all the population of the Russian Empire to agriculture, are the special forms of land-ownership of the Russian people, which make all the people property-holders, and consequently, attract them with indissoluble ties to the land. The owning of the land by the peasant sufficiently explains this love of agriculture and his tendency to remain in the limits of rural industry, as only

in this branch can he feel himself master of his own business. But the differences in the forms of land-ownership, such as collective ownership in most parts inhabited by the people of Great Russia, and of single or partial ownership on the western and southern borders, in Little Russia, White Russia, the Kingdom of Poland and the Baltic provinces, already produce an influence on the character of the agricultural industry in various places, on the conditions of its development and even on the ratio between the numbers of the rural and of the town populations in different governments. As has been mentioned, the latter is much more considerable in the west, where with the existence of partial ownership the landed property falls to small shares and a more or less considerable part of the population is involuntarily cut off from the land.

As to the ways of communication, their influence on the order of rural economical life in various places is not felt in such a marked degree as could be expected. But this very likely depends upon the fact, that only lately, with the construction of railways, various districts adjacent thereto have commenced to feel their influence even though lately constructed. Before, when the means of communication by water were comparatively limited in Russia, all the districts stood more or less on an equal footing with reference to the conveniences of transport. The snow furnished winter roads equally accessible and convenient to all. The difference in the advantages for selling consequently depended chiefly on distance; but this influence was counteracted to a considerable degree by the more substantial influence of the differences of climate, and especially of soil, often much more favourable to districts lying far from the populated centres and seas, and even larger rivers, than to districts lying nearer to the markets, as for instance, capital towns. This relates especially to the central black-earth tract, which before the construction of railways, and with the absence of navigable rivers, was nearly deprived of convenient means of communication. Nevertheless in former years, as well as at the present time, this region represented the centre of the farming industry in Russia. All the north and west of Russia, being under much more favourable conditions than the central tract in respect to markets, nevertheless, thanks to a less fertile soil, always has occupied a secondary place in rural economy; they not only have been unable to enrich Russia with the surplus of their products, but on the contrary, have themselves existed only through the other districts of the Empire. The centre, south and east are more richly endowed in this respect. As regards the south, with more favourable conditions of soil because of the fact that it has been very sparsely populated, has hardly more than outgrown the period of primitive agriculture. Moreover the high wages of the labourer would hardly permit of the cultivation of other than the more valuable products of the field, such as wheat and flax, as only such products could compensate the agriculturist for the labor and expense of cultivation.

Such in short are the conditions on which is based Russian rural economic life. Let us now examine the forms which it takes in various districts under the influence of these different conditions.

The woody nature of the northern and north-eastern districts of Russia and the nature of the steppes of the south and south-west call forth the existence of the so-called forest-field system of economy and the resting-system in their respective localities. The forest-field system means an alternation of agriculture with more or less lasting periods of forest-growing between. Properly speaking, the forest-

field system of economy as practised in most parts of the north and north-east districts of Russia, cannot be called a system of economy in the strict sense of the term, because, in most cases, the felling of trees and the clearing of the woods for the cultivation of grain, and afterwards, for the re-growing of trees, are practised without any definite plan. This is one of the simplest forms of primitive economy, and in which field-cultivation is of second-rate importance, as the portions of improved land, in most cases, are quite insignificant in comparison with the forests among which they are dispersed. The region of forest-field economy embraces at present the woody, damp, and unproductive soils of the governments of Archangel, Olonetz and Vologda and the far-lying districts of the Novgorod, Kostroma, Viatka and Perm governments.

The primitive resting-system of economy prevailing in the south is very like in character to the forest-field system, and presents also small cultivated areas lying between lands untouched by the plough or left in steppes. In this form of rural economy field cultivation alternates with more or less lasting periods of repose, serving to reinstate the productive forces of the land. As in the forest-field system, farming here properly speaking occupies a subordinate position. If there, the first place is occupied by forest economy, here the principal source of income is the raising of cattle, sheep, and horses. The resting-system of economy however in this primitive form is to be met with at present only in the fertile but sparsely populated steppes of the south and south-east, in the governments of Ufa, Orenburg, Samara, Astrakhan, in the Kuban, Terek, and Don Cossack districts and in some parts of the governments of Taurid, Kherson and Ekaterinoslav.

Between these two regions of primitive cultivation occupying both extremes of the Russian Empire north and south, lies all the rest of Russia, presenting in its enormous extent, with the varying conditions of soil, climate, population, distance from the principal markets, and different ways of communication, the following principal economic and cultivated regions:

The flax region presents in the north-west of Russia a degree of transition between the forest-field cultivation on the one side, and the region of grain cultivation and cattle-raising on the other. This region is characterised by the production of flax for fibre, which is sown here partly on forest-fallows, partly on ploughed lands, richly manured and improved by the cultivation of clover. With reference to the governments of Pskov, Vitebsk, Novgorod and parts of the Yaroslav, Kostroma, Smolensk, Vologda, Tver, Curland and some other governments, the flax region towards its borders gradually gives place to a region where cattle-raising predominates, and which is characterised in agricultural respects by the cultivation of such alimentary products as clover, potatoes, timothy, on ploughed lands, in rotation with other crops, and also by the abundance of natural meadows and pastures along the rivers and lake shores, on low-lying places, swamps, waste grounds and thickets, with which this region abounds.

The breeding of large herds of cattle and the abundant production of manure form the principal conditions of field culture in this region, where the land is so poor that it cannot avail itself of fresh fields nor leave the exhausted districts to rest, or grow young forests, as is practised in the three preceding regions. Thanks to extensive cattle-raising, and especially to the breeding of large-horned cattle, this region is characterised by a considerably developed dairy industry, and in geographical respects is rather dispersed, especially to the north and west, without any clearly defined boundary lines. In general,

the whole non-Chernoziom fields can be reckoned to this region, excepting the governments devoted to forest-field and flax cultivation, namely, those of St-Petersburg, Livand, Estland and Curland, Kovno, Grodno, Vilna and Mohilev, Moscow, Kaluga, parts of the Smolensk, Tver, Yaroslav, Kostroma, Vladimir, Riazan, Tula, and some other governments. This region, adjoining from the south the northern boundary line of the Chernoziom tract, here gives place to that in which grain cultivation predominates, and which in its turn can be divided into two separate parts, namely: the region of the prevailing three-year alternation system, and that of the improved resting, or many-year resting-system, or system of crop alternation with pasture.

The northern frontier of the first of these regions corresponds with the northern boundary line of the black-earth tract; from the south it is bounded by a district the average population of which does not exceed thirty persons to the square verst, and which forms the second separate region.

The region of grain cultivation with the three-year alternation system embraces the governments of Tula, Riazan (the black-earth part) Tambov, Penza, Simbirsk, Nizhni-Novgorod, Kazan, Orel, Kursk, Chernigov and parts of Saratov, Voronezh, Kharkov, Poltava, Kiev, Podolsk, and Volyn. Notwithstanding all the imperfections of the three-year alternation system, this region is the most productive part of Russia. Thanks to a temperate climate and fertile soil, good harvests are very frequent, at least until lately, and a considerable surplus of bread products over the consumption is guaranteed in normal years. The use of animal manure is common although in moderate quantities. In peasant farming manure is in most cases used on hemp plantations, and only seldom on the grain-fields, although its employment there is also increasing more and more every year. With a nearly exclusive cultivation of cereals, this region suffers in general from the want of forage, therefore cattle-raising here is a limited industry. The following crops are mostly cultivated: winter wheat and rye, in the northern part, and spring-wheat, oats, buckwheat and more rarely barley, peas and millet in the southern.

The following region, which can be characterised as that of grain-culture, connected with the "many-year alternation system", occupies all the northern part of the steppe tract, namely, the governments of Saratov, Samara, Voronezh, Kharkov, Poltava, Ekaterinoslav and Kherson, with the exception of such parts as should be referred to one or the other of the preceding regions. This locality is characterised by the production in great quantities of the more valuable sorts of grain, intended mostly for export. The difference between the system prevailing here, and the ordinary resting-system consists in the tendency to create artificial meadows and pastures, replacing preceding reposing-fields, and included in a more or less systematic alternation of seed.

Thanks to such meadows and pastures, cattle-raising is highly developed here and especially the breeding of fine sheep. Sheep-culture corresponds most nearly to the degree of development of the agriculture in this region, which has risen above the conditions of primitive steppe economy, and is sufficient for the breeding of large cattle and sheep for slaughter, but insufficient for the raising of the finest breeds of milch cows.

The following crops are particularly cultivated here: wheat, millet, oats, more rarely, barley and peas. In some places flax-culture predominates, but exclusively for the seed. The following crops, sown for the purpose of turning a formerly wild resting-land into a meadow or pasture, should be mentioned: timothy, clover and esparcet, in some

places lucern, darnel, and sparganium. Besides the growing of a considerable quantity of such grasses as fodder for cattle, they are also cultivated for their seed, in which there is a large trade in the north of Russia and abroad, especially in timothy and clover. Manure in most cases is not employed; or at least, the quantity of manured land is insignificant in comparison with the whole area under cultivation. The restoration of the fertility of the soil is exclusively reached by more or less lasting periods of land-resting, and which is rendered productive by cultivating the above-mentioned crops. With the sowing of grass with rich leaves and deeply spreading roots, as the lucern and spartum, the system of field cultivation reigning here would rank with the best improved, many-year alternation system.

The following beet districts are scattered among the preceding region of grain culture, and occupy a middle place between two separate districts, that of the three-year alternation, and that of the resting-system of economy. Although the cultivation of the beet for sugar is to be met with in several other districts of Russia, for instance, in the governments of Tula, Tambov, Voronezh, Samara and some others, properly speaking, only portions of the following governments should be assigned to the beet district: Kursk, Kharkov, Chernigov, Kiev, Podolsk and Volynia. The beet region, according to the character of its cultivation, approaches both the systems used in the southern tract; but the growing of beet and the manufacture of sugar therefrom bring, in this case, all the beneficial results that an introduction of bulbous plants and technical farming can effect on the whole order of rural economy. The same beneficial influence is effected in several other districts through the cultivation of potatoes for the distillation of brandy, but in an extent very limited in comparison with various other regions.

Besides the above-enumerated regions it is necessary to mention the tobacco districts, which are divided into several groups differing from one another in special conditions and methods of culture, as well as in the kinds of tobacco grown. These are the following: that of Little Russia, embracing several districts of the governments of Poltava, Chernigov, and the neighbouring districts of Kharkov, Kursk and Orel. In these places are grown, especially on lands richly manured and specially destined for tobacco culture, the lower sorts of tobacco, as makhorka and bakoun. In some parts of the government of Chernigov, the American cigar tobacco, gundi, is grown. The Bessarabian, Tauride and Caucasus regions are characterised by the cultivation of the higher sorts of tobacco. In the Samara region the makhorka is raised, and also the German cigar tobacco. Lastly, in the youngest districts in tobacco cultivation, namely, the middle black-earth region, dispersed in several districts of the governments of Tula, Riazan, Simbirsk, Penza, Tambov, and Voronezh, the makhorka is almost exclusively grown, and almost wholly by the peasants. However it should be noticed that the cultivation of tobacco in most cases presents a completely independent branch of agriculture, not only in not having any close connection with the rural economy of the country, but in its injurious results on other branches of farming, by consuming, for instance, all the manure of the entire estate.

Each of these enumerated regions has, besides, its independent forms and methods of cultivation, corresponding to local conditions and in consequence of the varying demands of local economy; however, the same forms often embrace several regions. So, in nearly all Russia, with the exception of its border-lands, the prevailing system of farming until the present day, is the three-year alternation system, with the cultivation

of grain predominating. The most general form of the three-year alternation economy is the following plan of crop-rotation: 1. fallow; 2. winter wheat; 3. oats, barley or buckwheat.

Notwithstanding the inefficiency of the three-field alternation system its continuance is explained by the fact that with the climatic and economic conditions in most parts of Russia it is possible to abolish it only by introducing and cultivating valuable spring crops, principally rhizocarpic plants and grass with a corresponding increase of cattle-raising. The introduction of such highly profitable crops into our system of agriculture should form one of the first and most important tasks of our farmers. Only by substituting better methods for the unsatisfactory three-year rotation system can real improvement in our farming be accomplished. However, important results in this direction have already been obtained, and a gradual change from the old methods to better forms of agriculture is going on at present in nearly all the governments of Russia.

The introduction of the potato, the increase of flax-cultivation for fibre, the sowing of better species of grass, as well as of valuable seed-plants for foreign markets, the development of the sugar beet industry, the shortening of the periods of unproductiveness of the land under the resting-system, the introduction of fallow-plants, and the cultivation of the resting-fields, a more abundant and universal employment of animal manure, and in some parts, of artificial manure, than in the past—such are the most characteristic and evident signs of improvement going on at present in Russian agriculture. This improvement can be noticed in all the districts of Russia without exception, assuming in some cases very peculiar and unexpected forms. In the northern parts of central Russia, a natural transition from the three-year to the many-year rotation system is noticed; whereas in the extreme south and north, rapid changes, due to the construction of railways, and to the increase of population and capital, are going on, from the primitive resting and forest-field systems, to the more improved methods of agriculture, passing over a whole step in progress, namely, the three-year alternation system, found to be unsuited to the more advanced condition of these districts.

The following are examples of the alternation of crops, under the primitive resting, and the improved many-year herb-alternation systems: 1. millet; 2. spring wheat; 3. flax; 4. peas; 5. barley; 6. oats.

After the sixth harvest, the land is allowed to rest and is not cultivated for fifteen to twenty-five years. In this alternation of crops, which is particularly general in the south-east of Russia, the complete absence of winter grain is noticeable. Sometimes, this alternation is prolonged by the introduction of two successive sowings of millet, or of spring wheat. Sometimes, in the first year after ploughing, the field is used for the culture of pumpkins, water-melons, and kindred crops.

With the introduction of rye, the alternation takes the following form: 1. millet; 2. spring wheat; 3. fallow; 4. rye; 5. oats; 6. and following years, rest.

In the south of Russia with the same system, the number of sowings is sometimes increased and the following alternation takes place: 1. flax or millet, sometimes maize; 2. spring wheat; 3. spring wheat; 4. oats or barley; 5. rye; 6. oats; 7. rye; 8. oats; 9. and following, rest.

The improved resting-alternation of crops with the introduction of some of the rudiments of crop-rotation is practised: 1. flax or millet; 2. millet or spring wheat; 3. fallow or rye; 4. winter wheat; 5. sunflower, sometimes maize; 6. barley or oats; 7. fallow; 8. rye; 9. peas, or buckwheat; 10. oats; 11. and the following years, rest.

Alternation of crops with a more developed crop-rotation is common, and with the introduction of the cultivation of rhizocarpic plants, for example, potato or beet: 1. millet; 2. spring wheat; 3. fallow; 4. winter wheat or rye; 5. barley or oats; 6. fallow; 7. winter wheat; 8. potato or beet; 9. spring wheat or barley; ten to fifteen years of rest.

The changes effected in the three-year alternation system recently in different districts of Russia consist chiefly in the introduction of grass crops, rhizocarps and flax; grass and rhizocarps; grass and flax, rhizocarps and flax, or lastly, grass and flax and rhizocarps together, in various combinations with other crops, especially with cereals.

In some places, together with the introduction of the alternation of perennial grasses, attempts have been made to change the unproductive fallow into a productive field, by sowing fallow crops, especially the admixture of tare or buckwheat.

In the central non-Chernoziom tract, thanks to the lately increased distillation of brandy from the potato, extending farther and farther east its cultivation is also greatly increased, even in peasant farming.

The following are examples of various changes in crop-rotation, practised in different parts of the Empire, showing modifications of the primitive three-year alternation and transitions therefrom to an improved many-year grain, or grass alternation system:

- |                   |                                  |
|-------------------|----------------------------------|
| 1. fallow         | 1. manured fallow                |
| 2. rye            | 2. winter wheat                  |
| 3. buckwheat      | 3. barley                        |
| 4. barley or oats | 4. buckwheat or tare with oats   |
|                   | 5. rye                           |
|                   | 6. oats                          |
| or:               |                                  |
| 1. manured fallow | 1. tare admixture after manuring |
| 2. winter wheat   | 2. winter wheat or rye           |
| 3. millet         | 3. buckwheat or peas             |
| 4. barley         | 4. oats or barley.               |
| 5. buckwheat      |                                  |
| 6. oats           |                                  |

The alternation with flax, practised in some places, for example, in the governments of Pskov, Tver, Novgorod on peasant land, is:

- |           |                             |
|-----------|-----------------------------|
| 1. fallow | 1. manured fallow           |
| 2. rye    | 2. rye                      |
| 3. oats   | 3. flax                     |
| 4. fallow | 4. fallow                   |
| 5. rye    | 5. rye                      |
| 6. flax   | 6. barley or buckwheat      |
|           | 7. fallow, slightly manured |
|           | 8. flax                     |
|           | 9. oats.                    |

The introduction of grass-sowing makes it possible to have a much more radical variation in crop rotation, as follows:

- |                    |                     |
|--------------------|---------------------|
| 1. fallow          | 1. fallow           |
| 2. rye with clover | 2. rye              |
| 3. clover          | 3. oats with clover |
| 4. clover          | 4. clover           |
| 5. oats            | 5. clover           |
|                    | 6. flax             |

or else:

- |                     |                       |
|---------------------|-----------------------|
| 1. fallow           | 1. fallow             |
| 2. rye              | 2. winter wheat       |
| 3. oats with clover | 3. peas and buckwheat |
| 4. clover           | 4. oats with grass    |
| 5. clover           | 5. grass              |
| 6. fallow           | 6. grass              |
| 7. rye              | 7. grass              |
| 8. oats             | 8. flax or millet.    |

The cultivation of such crops as the sunflower, maize and rape allow more variations in the forms of agriculture, for instance: 1. manured fallow; 2. winter wheat; 3. sunflower, maize or rape; 4. barley or millet; 5. fallow; 6. rye; 7. peas or buckwheat; 8. oats with grass, lucern and spartum; 9. grass; 10. grass; 11. grass; 12. flax or spring wheat.

With the introduction of potato-planting this crop generally occupies a place between the winter and spring cereals whereby the following order is observed: 1. manured fallow; 2. rye or wheat; 3. potato; 4. barley and oats.

This order is combined in different districts with other crops, for example, with flax and forage, and the following is the crop rotation:

- |                     |                      |
|---------------------|----------------------|
| 1. manured fallow   | 1. manured fallow    |
| 2. rye              | 2. winter wheat      |
| 3. potato           | 3. potato            |
| 4. oats with clover | 4. barley with grass |
| 5. clover           | 5. grass             |
| 6. clover           | 6. grass             |
| 7. flax             | 7. fallow            |
|                     | 8. rye               |
|                     | 9. oats.             |

Sometimes the potato is succeeded immediately by flax. In rarer cases, chiefly in the Baltic provinces, the potato takes another place, namely after clover, as follows: 1. fallow; 2. rye with clover-seed; 3. clover; 4. clover; 5. potato; 6. barley.

Sometimes, in a similar alternation of the seed, the potato follows barley; sometimes both the principal forms meet together in the same rotation:

- |                    |                    |
|--------------------|--------------------|
| 1. manured fallow  | 7. clover          |
| 2. rye             | 8. clover          |
| 3. potato          | 9. clover          |
| 4. barley          | 10. potato         |
| 5. fallow          | 11. barley or flax |
| 6. rye with clover | 12. oats.          |

Sometimes cases of excessive potato cultivation are to be met with, especially in the neighbourhood of brandy or starch manufactories; when potatoes are planted successively as follows:

1. fallow	or	1. fallow
2. rye		2. rye
3. potato		3. potato
4. potato		4. buckwheat
5. oats		5. fallow
		6. potato
		7. potato
		8. oats.

In many districts of Russia, in the neighbourhood of sugar manufactories, the cultivation of beet is introduced, even in peasant farming. The alternations of the crops with beet also offer a great variety; two principal forms are to be distinguished, the first and most extensive being: 1. manured fallow; 2. winter wheat; 3. beet; 4. spring crops.

The second principal form differs in that the beet follows the fallow, manured or not, or sown with a tare-admixture; the order of the crops in such cases is as follows: 1. fallow; 2. winter wheat; 3. fallow; 4. beetroot; 5. spring crops.

Agriculturists still differ among themselves as to which of these two forms should be preferred and therefore they often combine them. Sometimes the beet is sown two years running in the same field. Then, the beet often rotates with grass, particularly, lucern and spartum, as more suited than clover to the climate of those districts where the beet cultivation is concentrated. The beet crop is further combined with winter rape, which generally in such cases precedes wheat. Much rarer are beet and potato planted together, the potato in these cases following the beet. Lately, experiments have been made of sowing beet after grass, which have given very good results, especially as regards the quality of the beet and the sugar contained in it. The peasants of the vicinity of sugar manufactories generally cultivate the beet according to the three-year alternation system, sometimes after fallow and sometimes after winter crops. Deserving of attention are some special rotations to be met with in some places in the cultivation of certain commercial plants as sunflower, hemp, tobacco, and chamomile, as well as certain forms of half-field, half-garden cultivation. The sunflower is at times included in such alternation of the crops, as follows: 1. fallow; 2. winter wheat or rye; 3. sunflower; 4. oats, spring-wheat or barley; 5. sunflower.

Tobacco is mostly cultivated on special plantations, where it is grown year after year with the help of strong fertilizers, or of newly ploughed lands, where it is sown several years consecutively, giving place afterwards to cereals. Sometimes tobacco is included in regular alternations, as follows:

In Bessarabia.

1. wheat
2. maize
3. barley
4. wheat
5. tobacco

In North Caucasus.

1. tobacco
2. tobacco
3. wheat
4. rye
5. rye
6. tobacco.

In Little Russia tobacco sometimes alternates with hemp. In the government of Tambov tobacco is sometimes grown as a garden plant, alternating with other garden crops in the following order: 1. tobacco, 2. onions, 3. cabbage, 4. cucumbers. Hemp, as well as tobacco, is mostly sown on special strongly fertilized fields, in the vicinity of farm-yards, and sometimes it is included in the field rotation of the crops. In the government of Orel there exist, for instance, alternations with hemp in the following order: 1. hemp after manuring, 2. potato, 3. spring wheat.

In the government of Chernigov, on peasant lands, hemp sometimes alternates with potato, beet and other vegetables in the following order:

1. hemp	1. vegetables
2. hemp	2. potato
3. beet	3. hemp
4. potato	4. beet.

The following alternation is very interesting, as practised in villages near Moscow, where the cultivation of chamomile is very common: 1. potato, after manuring; 2. chamomile; 3. rye.

The introduction of the alternations of gramineous plants, rhizocarps and grass serves as a basis for a greater variety of cultivation and a higher development of crop-rotation, as is to be found in the governments lying in the north of the black-earth zone where in former times the three-year alternation system exclusively prevailed, as for example in the governments of Riazan, Tula, Tambov, Pensa, parts of Simbirsk, Orel, Voronezh and Kursk. Several central districts of Russia, as for instance, the Chernsk, Effremovsk and Novosilsk districts of Tula and the Eletsk district of the government of Orel, have a special aim in the cultivation of grass seed for the market. This profitable industry stimulates to a high degree the growing of grass crops in these parts of the country in great variety in the forms of cultivation. In the north-west, the above-mentioned numerous examples of combination in the cultivation of grain, grass, rhizocarps and flax for fibre, are to be found. In the non-Chernoziom tract, and especially on the western border, the cultivation of clover with timothy is at present very general. These grasses furnish the means for extensive cattle-raising, composing the basis of agriculture in these parts which, because of the naturally poor quality of the soil, demands much fertilizing.

In the Baltic provinces and in Poland, no farming is successful without clover; in some places, on sandy soils, hops are cultivated. In the north, in the government of Vologda, the sowing of timothy is very general, even on peasant lands. The abundance of moisture in these parts of the Empire guarantees good harvests of such grasses, and the severe climate prevents the development of parasites from which they suffer in the countries of the west of Europe, and especially from the clover-bug, which is nearly unknown in Russia. The absence of this foe to the clover-crop has engendered such confidence in the industry that great quantities of clover seed are raised for the export trade.

In the centre of the black-earth region and on the borders of the steppe tract where the three-year alternation region joins that of the real resting-system, which yearly decreases and moves farther to the south and south-east, a great variety of intermediate forms are to be met with, presenting at times an aspect of the former resting-system, and at times various combinations of the three-year alternation system of crops with more or less lasting periods of rest. The distinguishing feature of these

new forms of agriculture, arising from the three-year alternation and resting-systems, is the regulation of the cultivation and resting periods, with an abbreviation of the latter during which grass is sown, chiefly timothy, sometimes spartum, lucern, darnel, rarer still clover, which in consequence of the prevailing droughts seldom succeeds.

The introduction of new crops, as beet, maize, sunflower and rape into the alternation system, the transformation of the ordinary three-year alternation and simple resting-system into the better many-year alternation with a corresponding change of cereals and grasses, and in some cases rhizocarps, these are the chief signs of the improvements going on in this region of Russia. Often alternations of crops as practised here show an example of complete disorder and an absence of any system as, for example, in several districts of the governments of Voronezh, Kharkov and Poltava; but, side by side with very unsuccessful attempts to effect a change in the resting-system, at times there appear quite correct systems of farming and of crop-rotation, answering to local conditions and to all the demands of rational economy—alternations with a more or less developed rotation of rhizocarps, though proceeding from the primitive resting-system, but not differing in any way from alternations from the three-year system developed in other districts of Russia and even in the west of Europe. Starting thus on the one hand from the three-year alternation system, and on the other, from the old resting-system quite equal results are attained in both cases, namely: different forms of the many-year alternation system in which are merged the distinguishing features of both the primitive systems.

From all that has been said, the following conclusion can be drawn, that if even the three-year alternation system prevails in most parts of Russia, if the primitive forest-field system is still to be met in the north, and if the not less primitive resting-system is practised in the south and south-east, still side by side with them new and improved systems are coming in step by step. However, the old forms of field cultivation in many cases still hold sway, not so much in consequence of the backwardness of farmers and their aversion to change, as people superficially acquainted with the matter are inclined to think, but for quite sensible and solid reasons. The root of these systems should be sought for not only in the past but in many of the present conditions of Russian farming. The adoption of new ways and habits of rural economy, the improved systems of crop-rotation are also the results of a general development in Russian agriculture, and are signs of its progress, though slow nevertheless sure, and what is of more importance, self-dependent and reliable.

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## CHAPTER V.

**Cultivation of the soil.**

Sowing, fertilizing, cultivating, harvesting and marketing.

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**R**USSIA represents by its vastness and by its variety of climate and soil, as well as by its forms of land-ownership and of utilizing the ground examined in the first three chapters, great differences also in its methods of farming. In the preceding chapter some of these methods were examined as also the prevalent modes of agriculture and the systems of crop-rotation. All the above-mentioned conditions influence also the cultivation of the soil itself.

The quantity of seed is varied not only according to the different species used, but also according to the localities themselves. In general, the quantity of seed sown on given areas for the principal cereals is least on the black-earth steppe regions; nearly twice as much is sown on non-steppe black-earth soil, and the maximum quantity on the several districts of non-Chernoziom.

For rye the quantity of seed per dessiatine in different localities varies from four and one-half to twelve meras. The thickest sowings of rye, amounting to ten and more meras per dessiatine, are made in the Baltic provinces, in Viatka and in a few other industrial governments. In the other non-Chernoziom regions and in the black-earth part of the central agricultural district, this cereal is generally sown at an average of nine meras per dessiatine; in the whole of the non-steppe portion of the black-earth zone rye is sown at an average of seven meras, and in the steppe portions, five meras per dessiatine. Such are the variations in the proportions of seed per dessiatine of this cereal; while there are extreme cases in the steppes where only two meras, and in others, in the non-Chernoziom districts as high as sixteen meras per dessiatine are sown.

The quantity of winter wheat sown per dessiatine generally coincides with that of rye, varying from four to twelve meras, and in extreme cases from three to sixteen meras. Spring wheat is sown nearly as close as winter wheat. Of all the cereals oats are sown the thickest; in general on the same area double the quantity of seed-oats are sown as of rye. Usually the quantity of seed-oats varies from six to twenty-four meras per dessiatine; more than twenty meras per dessiatine are sown in the Moscow industrial district and in some of its neighbouring governments. In all the other parts of the non-Chernoziom region, except the western and Vistula portions, and in the adjacent black-earth governments, sixteen to twenty meras per dessiatine are sown. In most of the western governments and in the non-steppe black-earth districts from ten to sixteen

meras, and in the steppe regions less than ten meras of oats are sown per dessiatine. The thinnest sowings of oats are in the southern districts of the government of Samara where the average is six meras per dessiatine. In extreme cases the quantity of seed-oats varies from three to thirty-two meras per dessiatine.

The average quantity of seed-barley is from four meras per dessiatine, in the southern districts of Samara, to eighteen meras in Archangel, and is generally sown thicker than rye or wheat and thinner than oats. In extreme cases barley is sown as low as three, and as high as twenty-four meras per dessiatine. Buckwheat is sown approximately in the same proportion as rye, but in some places as thick as oats. Ordinarily this cereal varies from three to fourteen meras per dessiatine and in extreme cases from one to sixteen meras. As the seeds of millet are very small and grow branching stalks, it is very sparsely sown, generally from one to two and one-half meras, and ranging from one-half to five meras per dessiatine.

Indian corn is planted approximately in the same proportion as millet. Spelt is sown from six to sixteen meras and in extremes from five to twenty-seven meras per dessiatine. Peas from three to twelve and varying from one to sixteen meras per dessiatine are sown, and lentil from three and one-half to eleven meras. The potato, according to the locality, quality and object of its cultivation, is planted all the way from 10 to 240 meras per dessiatine.

As to the manuring of the soil there is great variety of method, many places requiring no manure whatever, while others are enriched by animal, mineral or artificial manure, as the exigencies may require. The fertilizer mostly used in Russia is certainly animal manure. In the non-Chernoziom governments it was universally used from olden times by landowners, as well as by peasants. The fallow lands are fully manured when possible, preferably for winter crops. When one-half of a winter field, for example, is manured one season, the other half is likewise fertilized the next season. In the northern and north-western governments, in the Baltic provinces and in Kostroma, Yaroslav, Tver, Moscow and Vladimir the fallow fields are fully manured for winter crops. In other governments of the non-Chernoziom region they are more or less thoroughly manured. It is only on the borders of the black-earth region in districts with gray or black-earth soil, for example in the southern half of Nizhni-Novgorod, the southern portion of Viatka, and in the Ural districts of Perm, that less than one-half of the field is fertilized with animal manure; while in several places of Shadrinsk, in the government of Perm, they are not manured at all. In Poland, only in the government of Warsaw do landowners and peasants fully manure their fields. In the other governments of Poland peasants usually manure only part and sometimes none of the fields for winter crops, preferring to use larger quantities of manure for spring cereals. In general, rye in non-Chernoziom governments is sown on newly cleared lands, and also, in rare cases, on fields previously manured for spring crops, and sometimes directly after the harvest of such crops. In the governments of Minsk, Smolensk and Tver some peasants manure their fields for barley, and as soon as the crop is gathered, sow the field the same autumn with rye. Furthermore, there are farms in the western governments in which winter fields are manured in early spring, after which on part of the field are sown tare with oats, following it with rye directly after the reaping of this admixture.

In other non-Chernoziom governments besides those just mentioned, parts of the spring fields are manured together with winter fields. In the government of Archangel

no cereal is sown without manuring. The fertilizing of winter fields, as well as of part of spring fields, is moreover effected in the western and north-western governments. Sometimes spring fields are better fertilized than winter fields, and in some districts all the manure is used on the spring field. For spring cereals less manure is used per dessiatine than for winter crops. The spring fields are mostly manured for potatoes, spring-wheat and barley, rarely for peas, whereas for oats, except in Archangel, fields are rarely manured. A field sown with barley is often fertilized in the spring after the sowing of the crop, especially in the north of Russia, whereby the manure, scattered upon the surface, serves an additional purpose of sheltering the young grain. In the Kingdom of Poland fields are mostly manured for potatoes, barley, peas and millet. It should be remarked that in the non-Chernoziom governments farmers, in case of a scarcity of manure, spread it more sparingly on the fields, so that one portion is not fertilized at the expense of the other.

In the black-earth regions the practice of manuring fields only began about thirty years ago, extending farther and farther to the south. In the northern non-steppe half of the black-earth region the manuring of fields is nearly universal with the landowners, as well as with the peasants. In this part of the black-earth region, except in Chernigov and Volynsk, manure is exclusively used for winter crops. Spring fields are only manured for beet crops in the sugar districts, especially in the governments of Kiev and Podol; and in several places in the northern part, fields are also manured for millet. Within the confines of this part of the black-earth region generally less than half of the field is manured, and only in extreme cases, as in the neighbourhoods of sugar refineries and distilleries, and in the suburbs of towns, the whole winter field is fertilized. There are those, especially the landowners, who fertilize their farms consecutively, passing from one district to another until each field is manured, covering a period ranging from six to thirty years; whereas in several places the peasants only manure their fields that are near their homes, ploughing and sowing their distant fields from year to year without fertilizing.

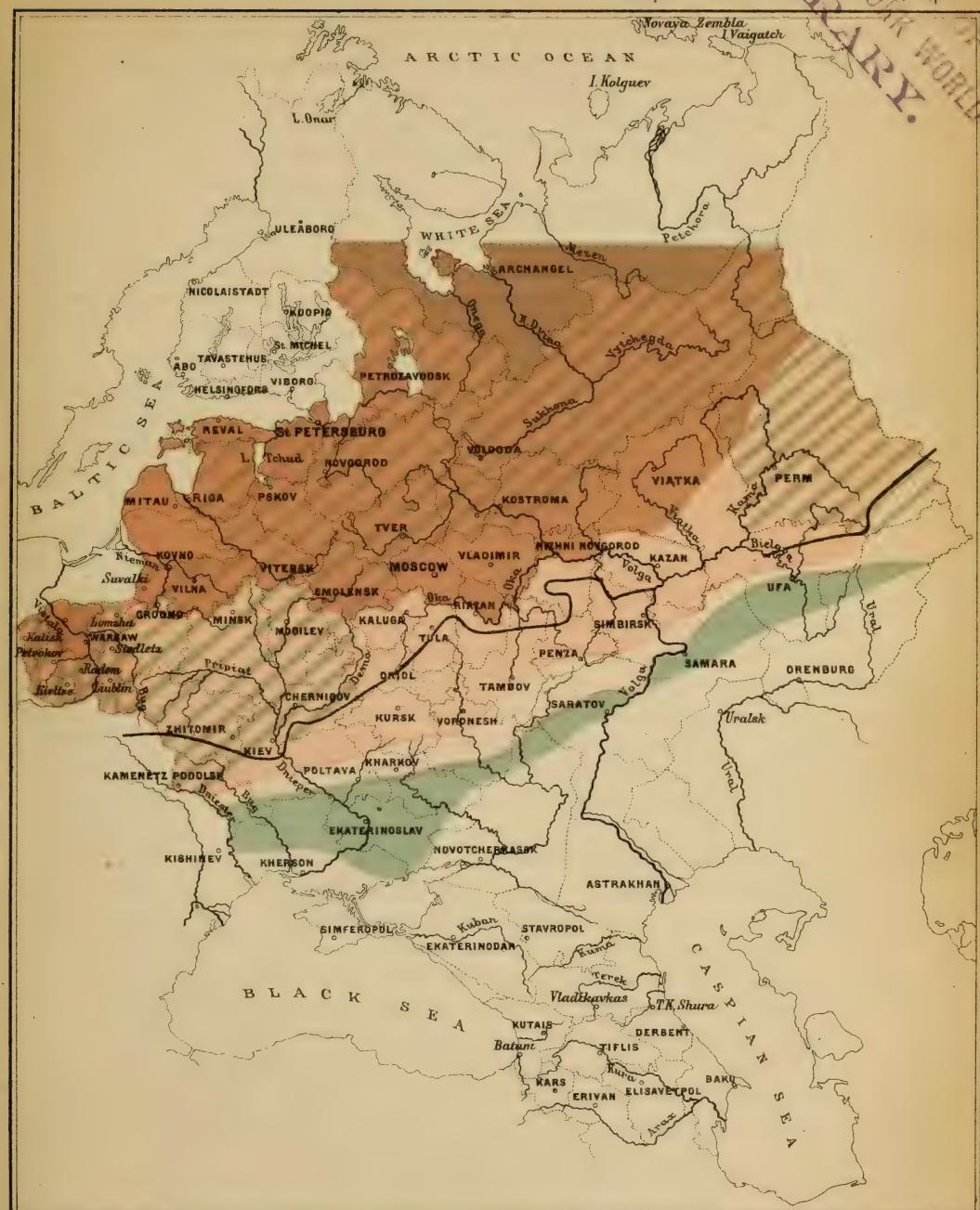
In the black-earth region, contrary to the practice in the non-Chernoziom districts more or less of fallow-fields are fertilized, according to the quantity of the manure on the farm. In places, especially those where the practice of manuring is more than twelve years old, the proportion of winter fields annually manured is greater on peasant lands than on the estates of proprietors. This is explained by the fact that there is relatively more cattle-raising on the smaller farms. In other cases the proprietors succeed in fertilizing their estates by purchasing manure from the peasants, paying for it from five to twenty-five kopecks per cart-load. In this region winter wheat fields are always manured in preference to rye.

Further to the south extends a narrow strip of land, where the practice of manuring fields is comparatively new, not more than twenty years old. In this region nearly all the landed proprietors fertilize their estates, while the practice is exceptional with the villagers and peasants. Still farther to the south follows a strip of land, where the fertilizing of fields began not more than eight years ago. The peasants of this region do not manure their fields in the least, excepting the German colonists there found. Here also the landed proprietors having begun to fertilize their estates, manure comparative small portions of their fields, and that generally for winter wheat, occasionally for spring cereals and the so-called oil-crops. Finally, in Bessarabia, Astra-

# FERTILIZING.

Chapter V. Cultivation of the Soil, Map №1.

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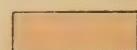
Del. D.P. Semenov.

Fertilizing of the entire winter and spring field.

Estate owners and peasants fertilize their entire winter fields.

Estate owners fertilize their entire winter fields and the peasants only part.

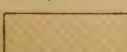
The estate owners and peasants fertilize part of their winter fields.



The greater part of the estate owners fertilize their fields, and some of the peasants.

Fertilized by some estate owners.

Part of the spring field is fertilized.





khan, and Orenburgh, in the province of the Don and the Ural, in some places of Kherson and Tauride, also in the districts of Tsaritzyn and Kamyshin of the governments of Saratov, and in Novouzensk and Nicolaev of the government of Samara, fertilizers are used neither in the farming of proprietors nor of peasants. Several very intelligent proprietors of these regions not only do not manure their fields but even claim that such fertilizing is injurious, arguing that manured fields suffer far more from drought than those unmanured. Places where the practice of fertilizing by proprietors and peasants is prevalent are shown in the accompanying map.

As to the amount of manure spread on the black-earth region, it averages about 3,000 pouds per dessiatine, and in special cases varies from 500 to 1,000 pouds; while in case of a scarcity of manure a less area is fertilized rather than lessen the quantity of manure per dessiatine. As a rule in black-earth governments from 2,000 to 5,000 pouds are scattered for winter crops, and the least for spring crops, especially millet. The greatest quantity of manure, namely 8,000 pouds in the government Chernigov are scattered on tobacco plantations and hemp fields. In general, the tobacco plantations of the Chernigov and Poltava governments, together with the hemp fields of the former, require such considerable quantities of manure that the other fields in these regions are manured much less than in the neighbouring districts. The great increase in the number of hemp fields in the western districts of Orel and in the southern part of Smolensk produces there a similar result as to the ploughed fields.

In non-Chernoziom governments, as stated above, the land proprietors as well as the peasants try to manure large areas, and if there is not manure enough it is thinly spread over the entire space annually. Therefore in non-Chernoziom governments the quantity of manure spread on each dessiatine varies not only according to places, but also from year to year according to the abundance or scarcity of fodder and straw. The largest quantity of manure, namely from 2,700 to 3,500 pouds per dessiatine, in special cases from 1,000 to 6,000 pouds, is scattered in the Baltic provinces and governments of Yaroslav, and of Moscow. In the other non-Chernoziom districts the quantity generally used averages from 1,400 to 2,300 pouds per dessiatine, and in extreme cases from 400 to 6,000 pouds.

The question of distance of fields to be fertilized from the cattle-yards, as manure is very heavy and of little value, certainly is of great importance. There exists for every estate a certain limit of distance beyond which the increase in the harvest would not pay for the extra labor of hauling the manure.

In governments where the fertilizing of fields is only yet commencing, as for example in the southern steppe governments, as well as in the eastern and south-eastern districts, this distance averages from two to five versts, notwithstanding that the villages are very large in this region, as well as the estates of proprietors, and that the fields are, therefore, situated very far from the homes. In the other black-earth regions, where the advantages of manuring fields are more appreciated by the agricultural population, also in places where fertilizing has grown to be a necessity, this limit is much greater, on an average from three to seven versts in summer, and in winter from eight to fifteen versts. The winter transport for such long distances, although practised, cannot always be considered profitable and the majority of farmers haul their manure not more than four versts. For this reason, in the above-mentioned part of the black-earth zone, in which the manuring of fields has become a custom, many of the large landowners have divided or intend to

divide their estates into several separate farms from 200 to 1,000 dessiatines each, with houses and sheds on each subdivision.

In the non-Chernoziom governments manure is hauled variously from one to five versts, and the extreme limit of transport in winter as in the black-earth governments is fifteen; sometimes the peasants buy manure in towns and haul it to their fields twenty to twenty-five versts distant. In general most of the non-Chernoziom fields are seldom farther from the estates than two to three versts; the average limit of transport is therefore very small, especially in comparison with the black-earth zone. As the greatest part of manure is scattered for winter crops, it is hauled to the fallow field before its first ploughing, at a time free from other farm work. Generally the transport of manure is begun directly after the sowing of spring crops, and ends at the beginning of hay-making. This time in many places is called by the proprietors and peasants *m e z h d u p a r i a*. On the southern part of the region where the fertilizing of fields is practised, the greatest part of the manure is hauled in May, sometimes in April, and ends in the beginning of June. Farther to the north, in the middle part of Russia, the greatest quantities of manure are hauled in the month of June; there the hauling in general is not begun before the middle of May, and in the non-Chernoziom governments, generally in the first days of June, and ends in the last of June, rarely is it prolonged until August. So, for instance, in the western governments, in some cases the manure is spread for winter crops sometimes even after the first ploughing, and in some cases even directly before the sowing. In the northern districts of the government of Chernigov the hauling of manure for winter-crop in August directly before the sowing has grown to be an old custom. In general, in the middle part of Russia the time mostly used for hauling manure, is the St. Peter's Fast or Petrovki, between the first and twenty-ninth of June; in some industrial and in the Baltic provinces, it is called *n a v o z n i t s a*, manure time. In the government of Viatka it is almost exclusively hauled in June; the peasants there have the firm conviction that manure hauled during the flowering of rye brings the best crops.

Besides the summer transport of manure to the fallow field for winter crops there exists nearly everywhere the winter-hauling. In such cases the manure is collected in heaps, averaging from 100 to 1,000 cart-loads and sometimes covered with straw in order to prevent its losing its virtue, as it must lie a long time before being ploughed; it is distributed in the surrounding field only in summer before the first ploughing. Such winter-hauling is practised almost exclusively on the more distant fields and especially in the black-earth governments. Winter-hauling is also practiced in the very north of Russia, and in the government of Archangel manure is exclusively transported on snow in sledges. As a rule it is hauled in January, February, and March over the last snow-way, and in the very north, in Olonetsk, Archangel, Vologda, Perm and Viatka on the contrary, during the first-sledging. For spring crops manure is ordinarily hauled in early spring, directly before the sowing, but sometimes also in autumn or winter. Barley is frequently covered with manure after its sowing.

The ordinary animal manure is generally mixed with straw-litter. But sometimes for want of straw, peat, dry leaves, moss, fir-leaves and even shavings are used for litter. Pure peat is sometimes transported in considerable quantities, especially on sandy fields with the view of augmenting the quantity of vegetable matter in the soil. The application of peat for litter and its transport into fields together with animal manure is mostly

practiced in the northern and western governments, where it is most frequently used. In northern governments peat is used as litter, and fir-leaves and moss are sometimes added, or composite fertilizers are prepared of animal manure, peat, fir-leaves, twigs, dry leaves, rotten chips and other rubbish. In western governments peat is used for litter as well as for manuring sandy fields. The hauling of peat is mostly practised in the governments of Grodno and Minsk. In the Baltic provinces sometimes sea-grass is used for manure, especially on the isle Esel, where it is hauled mostly for potato fields.

In general the use of different kinds of decayed vegetable matter with an admixture of animal manure is practiced chiefly in the non-Chernoziom governments; whereas in black-earth regions only straw is used as litter and is admixed with animal manure almost exclusively. Moreover, guano and other forms of animal manure are used in some parts of Russia. In non-Chernoziom governments, especially in suburbs of towns, near factories, and in general in densely populated districts, various forms of animal manure are used.

The use of guano is very general in industrial governments, and among the black-earth districts of Simbirsk and Kazan. In some places pigeon manure is transported in considerable quantities from towns, where it is collected on roofs and cornices of buildings. Manuring by means of imported guano is being practiced only on the Baltic shores. All sorts of animal and vegetable refuse and rubbish from different factories and work-shops serve also for fertilizing the fields in pure state or in admixture. Such fertilizing materials are however but little used in Russia.

Among the insufficient and artificial manures the phosphates hold the first rank. Fertilizers of such sort, namely hyperphosphates and oxide of lime are so well known that in a considerable region adjoining the Baltic sea, in the governments of Kovno and in some parts of Vilna, Vitebsk and Pskov, they are used by all. In this region hyperphosphates brought from abroad are applied not only on most of the estates, but also not unfrequently on peasant farms, and are used oftener than oxide of lime. In the other western and industrial regions in Poland, as well as in the governments of St-Petersburg and Novgorod, in moving farther from the Baltic shores, the use of phosphates as manures occurs more and more seldom in separate estates and very rarely by peasants, until finally it appears as an experiment, and an exception. In the regions where phosphatic manures are mostly used, hyperphosphates are preferred for manuring heavy clay soil, and oxide of lime for light sandy soils. As a rule, hyperphosphates are used either with or without animal manure. In the first case from six to twelve pouds are scattered to the dessiatine, and in the second, eighteen pouds. Landowners apparently use hyperphosphates mixed with animal manure for winter crops, whereas peasants mostly use them for fields, when there is a deficiency of other fertilizers. In the governments of Livland and Smolensk, bone-dust is transported to fields in quantities of twelve to seventeen pouds, most frequently fifteen pouds per dessiatine. Besides foreign hyperphosphates, in non-Chernoziom governments quantities of phosphites are used of late, the rich sources of which have been mentioned in Chapter II of this work.

Besides the above-mentioned region situated in the non-Chernoziom zone the use of phosphorous manures is being introduced in several black-earth governments, although they are applied only on very few estates, especially in south-western governments, also

in Kursk and Chernigov. Very recently phosphatic manures, owing to the working of phosphite mines, is becoming more rapidly in favour.

The importation of different sorts of fertilizers, principally hyperphosphates, and imported mostly through the ports of the Baltic during the last six years, was as follows:

Years.	Pounds.	Roubles.
1886 . . . .	1,075,210	606,338
1887 . . . .	1,436,100	796,801
1888 . . . .	1,856,268	1,029,532
1889 . . . .	2,134,662	1,197,197
1890 . . . .	2,679,131	1,396,976
1891 . . . .	2,344,990	1,117,227

This table shows the rapid increase in the importation of fertilizers and consequently the increase of their consumption.

The means of cultivating the soil, of harvesting the crops, of thrashing and cleaning the grain are very various in Russia. Sometimes even in one and the same locality, together with the most primitive methods there exist on some estates the most improved methods of farming. Nevertheless in separate large regions many ways and customs are so long established, especially in peasant farmings, that they change only slowly and gradually. Only such long-established methods of cultivating and harvesting the principal crops can be discussed here. Such methods are very uniform over the large areas of each of the three principal regions in which European Russia is divided, namely the northern, non-Chernoziom, non-steppe Chernoziom and the steppe Chernoziom regions.

The non-Chernoziom soils of the northern region are principally covered with forests or underwood, so that only small spaces are cultivated. The land destined for husbandry is dependent upon manure, as without fertilizers the soil produces very little. In the whole northern region, excepting the Baltic provinces and some places in the western and Polish governments, the fields are generally cultivated by means of the Russian plough, *sokha*, drawn by one horse. This primitive instrument varies in construction in different places. The plough, with the exception of the above-mentioned region, is not greatly used and is confined to private estates. In the government of Yaroslav and in some places of the governments of Moscow, Tver, Kostroma and Nizhni-Novgorod another kind of plough *kosila*, is used for cultivating the soil.

In using the *sokha* the soil is broken up generally not deeper than one and one-half to two and one-half vershoks, partly because only the upper active layer of soil is required. For spring crops the soil is mostly cultivated very early in the spring. The field, after being ploughed, is left for some time in furrow without harrowing and, if possible, until after a rain, that the soil may become sufficiently soft to be easily mellowed by the light wooden harrows in general use; often these implements are set with iron teeth. After the field is well harrowed it is sowed, generally commencing with the sowing of oats; the sowing is generally done by hand and then the seed is covered by means of the plough followed by the harrow. This order is, however, changed in different places in different ways; for example, if the soil is damp it is ploughed a second time, and then harrowed before sowing. When the young grain has shown itself the plough with the harrow following it, is again applied; such an operation is called *breakage*.

In such farms the soil to be prepared for oats is ploughed in autumn and is left in furrow during the winter; in the spring it is then mellowed and the field sown under the harrow and no more disturbed. In fact, such a manner of sowing is generally more successful than the above-described breakage method, as it gives better harvest. In the northern governments, namely Olonets, Vologda, Archangel, the Duchy of Finland and several parts of the government of St. Petersburg, oats sometimes do not ripen, a result of a very late spring and of a cold wet summer.

The reaping of oats in nearly the whole northern region is by hand, either with the sickle or the scythe, and the sheaves are made very small, two and one-half to three and one-half chetverts in circumference. For drying, they are collected into shocks, with six sheaves in a shock, one of them spread out as a cap for the other five, sometimes in shocks of twelve, or double shocks, arranged in the same manner. When dry, the sheaves are, if possible, stowed into barns. The thrashing is done during the whole of autumn and even partly in winter, after having been thoroughly dried in the sheaf in rather primitive drying-houses, or grain-kilns expressly constructed for that purpose, and heated with wood. The thrashing is generally by hand, with the flail. The winnowing on peasant farms is mostly done in the open air by the spade and wind-method, as machines for cleaning and assorting grain are seldom used.

The cultivation of barley plays a much smaller part in the agriculture of the northern regions, and the best land in the estate is required for it. The soil is ploughed in spring several times as carefully as possible; the barley as a rule is sown about ten days later than oats. Very often in different places of the northern region, especially in the east, the cultivation of spring rye on a small scale is practiced. Better ground is wanted for it than for oats, but it will thrive on poorer soil than barley; the sowing is done at the same time as that of oats.

Of winter crops, rye is chiefly cultivated in the northern region; wheat is sown only on private estates, oftener farther south and west, whereas in the east it is not sown at all. The first ploughing for winter crops is as early as possible, from the end of April to the middle of May. Some two weeks later the field is harrowed and evenly manured and then ploughed in, after which the field is left undisturbed until the end of July. Several weeks before sowing rye, which generally begins in the first days of August, the field is carefully harrowed and cleaned from weeds, which have grown during the time, and immediately after is ploughed and left in furrow. Just before the sowing, the field is once more harrowed and over its smoothed surface seed-grain is scattered by hand and immediately covered with harrows. Thereafter the whole field, if it should be in a flat somewhat damp place, is worked into ridges or beds. In the former case the ridges are made similar to those prepared for potatoes; in the latter, beds are made by means of cutting furrows with a plough from two to seven feet apart, as the condition of the field requires. This special labour is necessary that the field may drain its excess of water into the ditches.

In many places of the non-Chernoziom region at seed-time the rye is not yet thrashed and seldom even reaped, the sowing therefore is not with new but with old seed. Rye is mostly harvested with sickles; the sheaves are made rather small and are placed into shocks for drying in the field, with ten sheaves in a shock, the tenth being spread out, heads down, as a cap for the others. Such is the method of putting grain into shocks and of estimating the harvest. Sometimes the shocks contain

eighteen to twenty-two sheaves. There are ordinarily from 200 to 250, in rare cases even 300 shocks of rye to the dessiatine.

The people of the northern regions often clear their forests in order to prepare fields for cultivation. To this end the trees and undergrowth are cut down and piled, and after becoming sufficiently dry, are burned on the spot. Such new fallows are sown with spring-wheat, barley, oats, flax and sometimes also with rye. The special requisite for cultivating these clearings is that they must be early and sparsely sown; rye is sown on such fields in the month of June instead of August. Such soil gives excellent harvests, twice and three times better than the ordinary ploughed field; the grain is clean, large and plump.

The sowing of grass in the north, except the western and Baltic governments, is increasing very slowly and is principally practiced on large estates. Most often is clover sown together with timothy, and the meadows used as long as possible. Peasants prefer to clear the forest for one or two sowings and then to turn the field into meadows, sowing seeds of timothy and sometimes even clover at the same time with the grain.

The southern and eastern steppe regions, as mentioned above, have formerly represented a continuous grass steppe without wood. In the end of the last and the beginning of the present century there was no agriculture in these districts. The hard and generally dry soil, grown compact in the course of centuries and consisting of a network of fine roots, makes a primitive cultivation of it with light instruments, as for example the *sokha*, very difficult and almost impossible; the cultivation of ground, therefore, in the steppe region, with the primitive methods of ploughing, is effected till now exclusively with heavy ploughs of local invention and construction; these implements are known under the name of the Little Russian *sabán*, a two-wheeled plough. Notwithstanding the imperfection of such ploughs, the breaking-up of the steppes in general is very satisfactorily accomplished with the aid of oxen; horses are not used in these places. In fact, considering the work, together with the awkward implements with which it is effected, one involuntarily admires the art of the ploughman. By means of such a patriarchal instrument the ploughing of all the Russian steppes is effected, and only in later years has the many-knived plough been introduced, invented and constructed in the German colonies of southern Russia. Up to the time of its introduction the majority of virgin steppes were already broken and the soil softened, so that the new implement known by the name *bukker*, rapidly came into practice, not finding in hard soil any hindrances to its use. At the present time it is the prevailing implement in the southern steppes; whereas in the east the *sabán* still continues to be used.

Whatever the implement employed for cultivating spring crops, the fields are always ploughed in autumn, notwithstanding that the soil, dried from summer droughts, presents the greatest difficulties at that time. In steppe regions the spring is very short, and intense heat appears very rapidly; as the season is generally windy, the soil quickly dries, and it would therefore be too hazardous to delay till the short spring season the work that must progress but slowly, and covering great areas. On the other hand, the dry climate, the principal plague of the steppe region, obliges the farmer to try to preserve in the soil the autumn and winter moistures. However it often happens that in autumn the soil becomes so dry and hard that no instrument can plough it, and then the work is involuntarily delayed until spring. The fields in autumn are ploughed to various depths according to the soil qualities and to the requirements of the crops. In

tilling the steppes for the first time, the ploughing is not deep, from one and one-half to two and one-half vershocks; the addition of every extra one-half vershock requires a great increase of labour. On the other hand the steppe soil, even shallowly ploughed, gives excellent harvests. The following year the new fields are ploughed about an inch deeper and so on in subsequent years, until it is thus gradually ploughed eight inches deep.

In southern steppes, the soil newly ploughed is used generally for sowing flax, cultivated solely with the object of obtaining seed. Its sowing, as well as that of all cereals in the steppe region, must be as early as possible, directly after the melting of the snow, profiting as much as possible by the winter moisture. The spring sowings are harrowed in by means of iron harrows; afterward the fields, ploughed in the previous autumn and become dried and hard from lying, are harrowed soft and smooth. All the efforts of spring-sowing are aimed to finish it as quickly as possible, be it even at the expense of good work, provided that the seed reach the damp soil that the grain may have time to take root before the appearance of hot weather and dry winds. Mostly the sowing is done by hand, although in many places, especially on large estates, drills are used.

The earlier the sowing the better the growth, but on the other hand, the crop early sown is in danger of frost. Foreseeing this, wealthy growers in flax always have a second provision of seed ready in case of failure of the first, and they re-sow their flax fields after the first rain. Flax of the second sowing has time to fully ripen and even give a very good harvest, although the grain is not as large as that obtained from the first. If flax has been sown on newly ploughed steppes the crop is generally very clean and free from weeds; but if it has been preceded by other crops it must be weeded, and notwithstanding the high price of labour and the scarcity of hands, the expenses of weeding are cheerfully met. Flax is reaped when the kernels are mature, but before the heads have grown reddish, as otherwise, much of the seed would be lost. Seed-flax is reaped with a scythe; it is cut as near to the ground as possible, as it is in general very short, attaining scarcely one foot in height, and in dry years not more than nine inches. The reaped flax is left for some time in the field in swathes to dry, or raked into small bundles immediately after reaping; it requires thorough drying, otherwise it will be difficult to thrash it. After sufficient drying it is collected with rakes, laid in carts and hauled to the thrashing-floors.

The thrashing is done generally in a very primitive way, notwithstanding the high value of the seed. For this a special open place or thrashing-bed, called *to c k*, is prepared on sufficiently hard meadow land, and which is mown very closely and duly cleared, where the thrashing is then done with the *g a r m a n*. For this purpose the flax is laid on the thrashing-floor, in the form of a large ring, over which horses are driven, first at a slow pace, and after the mass has grown more compact, at a trot; the crumpled and crushed flax is then turned, and again horses are driven over it as before until all the kernels have been set free. The entire mass is then shaken out with rakes; the straw is removed, and the thrashed grain is shovelled into the centre of the thrashing-floor. However, flax is not everywhere thrashed by means of this method; in many places instead, horses with carts filled with men are driven over the flax-floors, and as many as possible. The thrashing by means of carts goes more rapidly than by horses only. In other places stone-rollers are used instead of carts for this purpose. After the thrash-

ing is finished, the cleaning is begun on the thrashing-place by hand-methods, with the aid of the spade and the wind. If the crops are abundant the winnowing continues the whole autumn. In some places, however, there are cleaning machines, mostly hand implements, with which certainly the work goes more rapidly. After winnowing, the grain is farther cleaned by large hand sieves, but even by means of sifting, the grain cannot be perfectly cleaned. In flax-seed prepared for market 10 per cent of dirt is allowed, whereas the admixture of millet in flax-seed is not in the least admitted, the millet being taken out by specially constructed apparatus. Straw left after thrashing, being worthless even for covering roofs, is used solely for fuel.

Harvests of seed-flax in the steppe-regions are exposed to considerable variations, and regardless of its quality and strength of soil much depends on the humidity of the summer weather. In wet summers the harvest is ten chetverts, and in dry summers it falls to one and two chetverts per dessiatine, but even such a crop does not prevent the farmers from continuing the cultivation of flax.

After the sowing of seed-flax the soil becomes clear of weeds, is soft and especially suitable to the cultivation of cereals; therefore, after seed-flax, on new soil spring-wheat is generally grown. In southern districts the red spring girk'a and other similar varieties are sown; they have become renowned in European markets and are known under the general name of Russian red wheat. The field is ploughed, as for other spring crops, always in autumn at a depth of two and one-half to three and one-half vershoks according to the conditions of the soil. If wheat is sown as a second crop on new soil, the earth is ploughed not deeper than two to three vershoks; whereas if it is sown as a third or fourth crop it is ploughed to a depth of three to four vershoks if the soil is yet too compact, and with buckers if it is soft enough to admit of the application of such an implement. In spring the sowing of wheat begins very early, earlier than all other cereals, notwithstanding the damp condition of the soil. On small farms seeds are sown by hand, and on large farms with the drill upon the ploughed field without previous preparation, and then harrowed in. Notwithstanding the early sowing young wheat very rarely suffers from spring frosts, but often the wind bares the fields of snow and then the grain freezes out; sometimes insects destroy the entire crop.

Although wheat is sown on soil containing more grass than flax, it is never weeded except in wet summers. Until very recently the reaping of wheat and of other cereals was by hand, while now the hand-reaper is largely supplanted by machines. For this purpose the majority of even the smallest peasant farmers provide themselves with reaping machines built on the steppe region and sold for comparatively small prices. These instruments are mostly of very imperfect construction; they have no binding apparatus and even no contrivance for throwing off the sheaves, that work being done by a workman sitting on the machine. Grain thus reaped and thrown on the field is not tied into sheaves but is laid in ricks like hay, and remains so until removed from the field, the hauling being done only after the reaping is completed, generally in the latter part of August. These ricks are hauled to the thrashing-places, which are generally on the farms. The vastness of the fields and their usually great distance from the farmhouses cause the removal of the crops to be one of the most difficult tasks of the farmer.

The thrashing of wheat and of other cereals is effected in different ways; on the estates of rich proprietors it is by means of improved complicated steam-machines, very

much used in the south; on the majority of large, and in many of the smaller estates of the peasants and colonists, horse thrashing-machines are used; while in few places thrashing is done with the flail or by the garman method. The thrashed grain is best cleaned by hand fanning-mills and assorting machines; in some cases the work is done by means of hand-sieves. The grain of the southern steppe region contains a greater or less percentage of impurities according to the methods in use for cleaning.

As to the natural qualities of the grain the special red wheat of that region excels all others; the kernel is plump and dry, has a thin hull and gives a large proportion of white flour and of nitrogen, and has well deserved its reputation on the European markets.

After the sowing of red spring wheat as a third crop on newly ploughed fields, follows a similar crop, if the soil is sufficiently strong and clean; should it be otherwise another sort of wheat is taken, less exacting of the soil, but which in return gives a grain of lower quality; ordinarily it is some local variety of so-called Russian wheat, which gives a smaller and paler kernel than that of the red girka. If, however, the strength and cleanliness of the soil does not promise a good harvest of wheat, it is sown with barley, which in these places is of the small species and is not valuable for brewing purposes. After barley, the field is sown with oats, a less exacting cereal. For all these grains the soil should by all means be ploughed in autumn. This is chiefly done with the bucker as deep as three to three and one-half vershoks. The sowing in spring is harrowed in the same manner as red wheat; the reaping and thrashing are done as with winter crops.

After four to six sowings the further utilization of the soil of new steppes is effected in two ways. In the first case, it enters into the regular three-year alternation period, and colonists cultivate maize on spring fields, and chiefly rye on winter fields, and in the very southern districts, winter wheat, and on spring fields chiefly barley and oats; while in other places flax, millet and inferior grades of wheat are grown. In the second case, the soil is allowed to rest for a long time. A definite order of vegetation then takes place thereon. First, high-grass grows, only good for sheep-pasture, then graminous, chiefly redtop (*triticum repens*) giving in good years abundant crops of excellent hay; and finally appears the steppe grass, *festuca ovina*, or *stipa pennata*; the steppes then give little hay, twenty to thirty pouds per dessiatine, and are better used for pastures for horses and cattle. The time necessary for such resting of the fields depends upon the natural qualities of the soil and upon the location. The richer the soil and the more southern, warm and damp the place, the less time required for its repose. In other instances, as a rule, such time is long and varies according to circumstances, from ten to fifteen years.

The steppe districts of the east of Russia produce somewhat different crops than those of the south, somewhat dependent upon the fact that in the east ploughs of many-knives or buckers are little used; the cultivation of the soil is mostly with the primitive plough-sabanes, similar in construction to the plough of Little Russia. Here, as well as in the south, for spring-sowing the soil is nearly always worked in autumn. In ploughing new steppes, or in breaking up the steppe fields that have recruited under repose, the first ploughing in the eastern regions is not in autumn but in summer, generally in the beginning of June, because in autumn the earth is too much dried up,

and has grown too hard for the plough. On the other hand, because of the dryness of the summer of those places, the furrows of the upturned earth do not become overgrown with grass and remain black and clean from the ploughing until the spring. At the first breaking the earth is not deeply upturned, usually from two to two and one-half ver-shocks, and often in the first year such fields are used for the culture of watermelons, muskmelons, pumpkins, cucumbers and the like. In spring, after the soil has somewhat dried, the hard clods are broken up by means of hoes, and small beds from two to four feet square are prepared. Such beds are made at distances of seven to ten feet from one another, and in each two to three seeds are planted, being pressed into the earth by the hand or the foot. If the young plants should be frost-killed, as is often the case in the month of May, a second planting is made if there is time, but in other beds, newly broken up and prepared in the spaces left between the first. After the sprouts have appeared and are well beyond spring frosts, the soil is freshened between the plants, by means of the Russian hoe. During the summer, the field is thus hoed several times according to the necessities of the case, as it is very important to keep it porous and free from weeds.

The growing period of all melons is very long, due to the great amount of heat and little moisture, two characteristic features of the summer in the eastern region at the time of ripening, which is generally from the middle to the end of August, when autumn frosts which appear very early, threaten the crops. Notwithstanding the risks of such products of the soil, they nevertheless are profitable to small peasant farmers with large families. Under favourable circumstances the returns of a melon field pay one hundred per cent upon the value of the labour invested. Watermelons, muskmelons, cucumbers, pumpkins and squashes furnish a cheap food for the local population, and are besides exported to large interior markets and to towns. Melon fields are cultivated, however, chiefly on newly ploughed fields throughout nearly the whole length of the black-earth zone.

The immense amount of labor expended on the cultivation of a melon field, together with the insecurity of its products, put a limit to the extension of this culture, which on a whole occupies much less space than that used for wheat and other cereal and oil-plants. If a hard-soiled piece of resting-land or steppe cannot possibly be used for a melon-patch, hard spring wheat, *triticum durum*, is generally sowed thereon. The eastern steppe region is deservedly renowned for its hard wheat, of which there are several sorts. They all have, however, general traits: namely, the kernel is very large and attains an absolute weight of 70 milligrams, is of a pale yellow colour, has a horny fracture, is very hard and almost transparent. Because of its hardness it requires special methods of thrashing. The flour is yellowish and the bread baked from it has a red crust and excels all other kinds of wheat in taste and in nutritive qualities. The hard wheat is prized very highly on Russian interior markets, much higher than the other varieties. Unfortunately on European markets it is valued lower than the softer kinds of the Russian red and American wheats. The sorts of hard wheat existing in the east differ one from the other in the quality of grain, as well as in the economic relation of the plants. The best of them, as regards the quality of grain, but also the most exacting with reference to soil and cultivation, is known under the name of *bieloturka*, hard wheat; then follow *cubanka*, *krasnoturka*, egyptian and others.

Hard wheat, *bieloturka*, is generally grown on the very richest soil of the

east; for its cultivation either new land, freshly ploughed, or very old resting-fields and rich soil are required. The bieloturka, as well as the other varieties of hard wheat, take a longer time for growing, and demand more heat than softer wheats; therefore it is sowed in spring as early as possible, and before all other cereals.

As regards the quantity of grain used for seed, it is noticeable that hard wheat is very sensitive in this respect: if the sowing is a little too thick the kernel will be of unsatisfactory quality.

The reaping of hard wheat is by hand and with the sickle, if the stalk is sufficiently long; but there are years when it is so short and thin that it is pulled instead. As the qualities of the kernel of hard wheat depend chiefly upon the perfection of its colour, its brilliancy and thorough dryness, the reaping in mornings and evenings is not practised. After the reaping is over the wheat is tied into sheaves, measuring from three to four feet in circumference; reed grass is generally used for binding, or straw of other longer cereals. For drying, the sheaves are placed in the field in shocks, of thirteen sheaves in each; they are so arranged as to guard as well as possible the grain from rain. Four crosses form a shock, the number of which shows the amount of the harvest. Therefore, as the sowings are sparse, the size of the sheaves large, and the straw very short in the east, the harvests generally appear very small, when estimated by the number of shocks. On the other hand these shocks give a large yield, as it frequently happens that a shock of wheat of fifty-two sheaves gives thirteen to fourteen pounds of grain. After the drying of the sheaves they are hauled to the thrashing-floors, which are often prepared beyond the farm-yards on the wheat field itself. The thrashing is by the same means as in the southern region; but in the east improved implements are not so common, and therefore, thrashing machines, especially steam machines, are very seldom found.

After the melon crop or after hard wheat, bieloturka, on the newly ploughed steppe in the east, generally follows red millet. In steppe soil millet accustoms itself to the dry climate, and not requiring much moisture grows very tall and has thick stalks. In such cases it must be reaped with sickles; but if circumstances permit it is preferably reaped with a scythe. The sheaves are, similar to wheat, tied and arranged in shocks. Its thrashing is effected in the same way as wheat. The harvests of hard wheat as well as of millet depend chiefly on the weather, but also on the quality and cleanliness of the soil. Wheat, bieloturka, sown as a first crop on new soil, produces on an average ten chetverts of grain per dessiatine, but sometimes its harvests attain fifteen and even twenty chetverts, and descending as low as one to two chetverts. Millet sown after a melon crop yields on an average fifteen to eighteen, and in good years twenty-five chetverts; more rarely than wheat does the millet crop descend as low as two chetverts per dessiatine.

After millet as the second sowing of a newly ploughed steppe, less valuable and easier-growing varieties of hard wheat are sown, as cubanka, krasnoturka, egyptian, repeating the crop also in the fourth year and sometimes even in the fifth, if the soil is sufficiently strong and clean. But with every year the harvests are less, and the quality of grain lower. After several crops of hard wheat the easier-growing soft red wheat is sown which is also found in several varieties in the east, and of which the saxonka is much prized on English markets. The means of cultivating and reaping soft wheat are the same as those of hard wheat, with the difference that it is generally cut with the scythe and not with the sickle.

After several harvests of hard and of soft wheat the soil generally becomes so weak and weedy that further crops are unprofitable. The farmer of the eastern regions, therefore, is obliged to expose it to fallow cultivation, after which period he generally sows rye, then oats, when the soil is left to rest, or used in the three-year alternation system.

The non-steppe Chernoziom region as regards the methods of cultivation may be divided into two parts: one consisting of the south-west and Little Russian governments, and the other of the central agricultural and the east black-earth non-steppe districts. In the former and in Little Russia ploughing is done with oxen. On the whole the methods of cultivation are similar to those above mentioned and applied in southern steppe districts, although the cultivation of beet in the south-western governments requires a very careful preparation of the soil which is ploughed as deep as six to seven vershocks. In the latter region ploughing is done with horses, and the cultivation of the soil with ploughs of different systems is practiced only on some of the large estates; whereas peasants use only the Russian plough with one horse, as in the northern districts, although it is somewhat larger and stronger and is able to turn the soil somewhat deeper, from two to two and one-half vershocks. For spring crops, peasants generally plough their fields in the spring; whereas on estates they are obliged to plough in autumn. The first spring sowing is oats, as early as possible, although the soil be quite wet. The field is previously somewhat smoothed with wooden harrows of very imperfect construction, and only able to work the soil under especially good conditions. In sowing oats, however, not so much care is taken to mellow the soil as to sow early, as the seed requires a great amount of moisture for its successful growth. After the sowing, which is generally by hand, the seed is covered with the plough to which is tied the same wooden harrow as used for smoothing the roughness of the earth and partly softening it. The field is then left alone for several days for the seed to sprout. However on estates, very often the horse-sower is used. When the oats have sprouted from one-fourth to one-half inch, the soil with its growing seed is again ploughed, but this time it is cross-ploughed. This second ploughing is called *b r e a k a g e*.

There are years when the spring begins very early, snow melts rapidly from the fields and farmers simultaneously commence the sowing of oats, at the end of which the weather rapidly changes, cold sets in, sometimes even with snow; but such a change in the weather does not injure the young crops; there are times when it is even noticed that the snow-fall upon the young sprouts has aided their further growth and results in better harvests. Oats, as well as all the other cereals of the region described, after ripening are cut with cradles. The rows of cut grain are left for some time to dry; the farther north the longer the grain is in drying. In the more southern and eastern parts of this region grain is bound into rather large sheaves immediately after it is reaped and arranged in cross-shaped shocks in the field, with thirteen sheaves to the shock; four such shocks form a rick, the number of which defines the amount of the harvest.

After the reaping of oats, as well as of other cereals, and after having been sufficiently dried, they are conveyed to the sheds, barns, covered thrashing-floors and drying-places. At the barns, or thrashing-floors, the grain is stacked, from 150 to 300 shocks per stack. This stack is made to taper to a point, and in the northern regions the top is carefully covered with straw to shield it from rain. The thrashing of all

cereals in peasant farmings of small dimensions is mostly by the flail. On large and small estates the grain is thrashed by horse power or steam-thrashing machines, and often all the improved machinery requisite for cleaning and assorting grain can be found on some of these estates. Horses necessary for thrashing on estates generally belong to the proprietor, and workmen are secured from neighbouring villages, who either receive daily wages or are hired by the month for the thrashing season. In many places peasants form a sort of stock company and hire themselves out for the thrashing of all the grain of the landlord at a definite price per rick, or per poud of grain. Having learned this kind of work, such a company provides itself with its own small portable horse thrashing-machine, together with a hand fanning-mill and thrash and clean by contract all the grain of the estate as well as that of the peasants, who fully appreciate the value of a quick-working thrashing-machine in the dry, hot, summer weather, but who have not the means to provide themselves with such an instrument. The oat kernel of the central black-earth regions is of excellent quality and is exported in great quantities to European markets; the white, heavy, large grain of the northern parts of this region under different names, is highly prized, and is well worthy of its fame.

As above-mentioned, for the other spring cereals on estates the soil is ploughed in autumn. In spring, after it has somewhat dried it is harrowed, ploughed a second time with the *sokha*, and softened with harrows immediately following the plough. The sowing of millet and, especially of buckwheat, is much later than that of oats. There is therefore sufficient time to carefully prepare the soil. Millet is sown from the first to the end of May and even in the beginning of June. Some days later, when the seed has sprouted the field is cross-ploughed, similar to the breakage of oats, without which millet generally gives a poor crop and largely becomes overgrown with weeds. Millet grows very slowly and requires a large amount of warmth for its full development. It is one of the crops that requires much light and does not flourish in company with weeds, therefore the field must be diligently, and frequently weeded, a process that requires much expense, often not repaid by the harvest. Such a sensitiveness of millet to weeds is compensated by its fitness to dry climates. For its successful growth it requires much less moisture than other grains, and in dry, hot summers, when other cereals give bad harvests, it yields the farmer a good crop of grain, and furnishes good straw for cattle. The time of growth of millet is very long, much longer than that of oats, and being generally sown after it, ripens much later, not before the middle or the end of August. The grain of millet at the local mills, after hulling, is made into yellow grits (*psheno*) used for gruel and other forms of food. The ripened millet is reaped in the same manner as oats.

Buckwheat is sown later than millet and in general only after the spring frosts as the young sprouts are easily killed by the cold. For buckwheat, the soil upturned in autumn is re-ploughed in spring several times, whereby care is taken to soften it as much as possible, by harrowing it after every ploughing. Having prepared the soil, if it is yet not sufficiently damp, and the weather dry, rain is awaited, after which the sowing commences. It is then immediately harrowed in, as lightly as possible. Sometimes before the sowing the soil is carefully ploughed into as small, equal and numerous furrows as possible, and on the ridges thus prepared the seeds are scattered, covering them with harrows; the latter system of buckwheat-sowing is very successful on soft soil. Seeds are lightly covered with earth in the view of hastening if possible

the sprouting of the grain, which does not require much moisture, but which suffers from too much rain before it has taken root; the wet earth in drying forms a crust on its surface, which greatly hinders the early growth; later, it requires frequent, quiet, warm rains whereby the grain rapidly rises and entirely covers the field with its abundant and thick branches. In consequence of the deep shadow it produces, no weeds can grow with it; its thick cover prevents the soil moreover, from drying by the wind and sun, and the earth, therefore, after the buckwheat-harvest, is very soft and clean. In consequence of this peculiarity, it is sown on the most weedy fields and on those exhausted by cultivation, the more so as buckwheat requires less strength of soil in comparison with millet and oats. Thus the sowings of buckwheat not only produce grain of high quality but also improve the soil, and it is noticed that in those farms where it occupies a considerable portion of the fields, the harvests of cereals are better than those of the neighbourhood where the sowings of buckwheat are inconsiderable.

Of late years, probably from climatic reasons, good harvests of buckwheat are very rare and the cultivation of this crop has therefore grown to be very expensive and its sowings reduced to a minimum. However, as the whole Russian army consumes gruel of buckwheat, and as the whole population of the country use it for food either as gruel, or in other forms, the demand for it consequently continues to be very great. Unfortunately science as yet has not shown the real causes of bad harvests of buckwheat and experience has not yet found measures to prevent them.

Similarly to oats and millet buckwheat is cut with cradles and is left for a long time in the field until it is sufficiently dry, when it is bound into sheaves and hauled to the barns where it is thrashed by hand or by machines. All the existing machines thrash buckwheat very imperfectly; they not only ruin the grain for seed, but also break the kernels themselves, as they are not very hard, so that much is lost in the cleaning. In many places, therefore, it is preferred in dry weather to thrash buckwheat by hand, the flails easily knocking the kernels loose without injuring them.

Whatever the crop with which the spring field of the three-year alternation of seed was combined, the soil on the following year is left under fallow in order to prepare it for the sowing of the winter crop, rye or wheat. The soil of fallow fields of the central black-earth region of Russia becomes covered, especially in damp years, with strong thick weeds, offering good food for cattle. Therefore, from want of meadows and pastures all fallow fields in the course of the spring, and until the first ploughing, are used for pasture of horses, cattle and sheep.

The first ploughing is begun generally in the beginning or the middle of June, and in peasant farmings with the *sokha*, and on estates with ploughs of better make, after which the field is left alone in order to allow the weeds thus cut and uprooted to die. Three or four weeks afterwards, in every case after a rain, the ploughed soil is harrowed, and if the rain is considerable, even the light wooden harrows sufficiently soften the tender, black soil. In the other case, the soil remains covered with dried clods of earth awaiting a favourable moment. Two or three weeks later, generally in the end of July, the fallow is again ploughed with the *sokha*, but this time cross-ploughed and more deeply, after which the field is generally not re-harrowed, or if harrowed only in case of a very hard rain, and only on such fields on which the harrowing after the first ploughing was in vain. After the double ploughing the field is considered to be prepared for the sowing of winter rye, if possible after rain, in order to have damp earth.

In central Russia such a rain is expected in the beginning and middle of August, and after it the sowing is immediately begun. After the rain has sufficiently moistened the fallow-field, winter rye is sown without any preliminary smoothing or softening of the soil, and it is cross-ploughed into the soil with *sokhas* as shallowly as possible. After the ploughing of the seeds the field is generally not harrowed and is left in furrows for the winter; the ridges become covered in autumn with thick sprouts of winter rye, whereas the furrows between them produce scarcely anything. The leaving of the fields in furrow guards the young crop from glazed frosts which occur here rather frequently in consequence of thaw in winter.

In the central black-earth region rye ripens in the beginning of July. Its reaping, by reason of the immense areas occupied by it, represents for the population the most difficult time in the year — the so-called *strada*. In normal years the reaping is effected with cradles, but not in all places is the grain left in swathes to dry. In the dry places of the eastern region, the swath is not laid in rows but is left inclined towards the uncut crop, and is bound immediately after reaping. In case of very good harvest, when the rye grows as high as five to seven feet forming a thick and hard stalk, it becomes difficult to cut it cleanly with scythes; in such years it is generally cut with the sickle. Such work however requires a great many workmen and embarrasses greatly the farmer. The sheaves are placed into cross-ricks which serve to indicate the amount of the harvest. After the drying of the ricks they are hauled to the barns or grain-stacks. The thrashing is begun as soon as possible, in order to provide the farmer with seed for the approaching rye-sowing. Contrary to the practice in the non-Chernoziom region the sowing with old seed is extremely rare on the black-earth zone. After having secured a sufficient quantity of seed the thrashing of rye is stopped, and that of spring crops begins, as rye preserves better in stacks than spring grains. As a rule there is no drying of grain in sheaves in the black-earth region. In case it is not sufficiently dry to keep well it is dried by artificial means, on private estates. In many estates as above-mentioned the cultivation of the soil is effected, if possible at least once a year, with more or less improved ploughs, generally that of the German Hohenheim or the sack type being used in this region. For harrowing the soil, iron harrows or wooden with iron teeth are employed. Many farmers have cultivators for softening the soil, and for successful farming, ploughs with many points, mostly of German type. In many estates of the non-steppe Chernoziom region, drills and sowers are used.

The potato is cultivated for the purpose of distillation or for the manufacture of starch, on estates as well as on peasant farms. In the latter it is moreover used in great quantities for food. Of late years its cultivation in the central region has greatly increased, but great difficulties are met with for its sale, as large distilleries are very scarce in those places.

On many estates of the south-western, as well as in the Little Russian and central governments, there are sugar refineries, and therefore the cultivation of the beet prevails; on such estates the soil is always turned much more carefully with ploughs. On some estates of the central region grass is also grown, mostly clover and timothy, or the mixture of both. Besides the culture of many oil-plants, namely sunflower, poppy, flax and others, which will be described in the following chapters, the cultivation of seed-clover in some places of the central region should be mentioned. There are places where

it is introduced not only on estates but also in peasant farmings, and from such places the seed is exported even to European markets. Clover is mostly sown after winter crops, and if possible in spring on the last snow, not awaiting its final melting and baring of the soil. Clover seeds being sufficiently heavy penetrate easily into the wet soil; it is considered that by this method the sprouts are provided for in the best way. Clover cannot be sown in many successive years, usually from one or two years, very seldom three. During one of these years it is left on the field till the seed ripens, whereas in others it is mown for hay. Seed-clover is reaped in the same way as spring grain; it is mown with scythes, tied into sheaves and placed in shocks. On estates the thrashing is done with machines and for the final cleaning of the seed from its hull, special clover rubbing-machines are used, mostly those of the Shevel type; the grain is then cleaned and assorted by hand and by horse assorting-machines, and by different sieves till it is fit for the market.

The harvests of clover seeds are exposed to great variations; fifteen pouds of grain per dessiatine are considered as a good harvest, twenty-five pouds excellent; whereas bad harvests descend to five, three, and even two pouds per dessiatine. In peasant farmings the thrashing of clover is generally with the flail, and in order to obtain greater success it is previously dried in sheaves in drying-apparatus, usually of the most primitive construction. In order to thrash clover in summer and press the grain from the hull which closely sticks to it, the thrashing with the flail must be very thorough, and the grain is sometimes rubbed in a mortar. In fact the peasant is not lazy and spends the greater amount of his time on the difficult stages of clover-thrashing. Clover seeds are sold at very high prices, especially if on the European markets there is a scarcity of American seed. The price of clover seed in the interior of Russia then rises to ten and twelve roubles per poud, seldom less than six roubles.

## CHAPTER VI.

**B r e a d s t u f f s .**

Classification of lands according to distribution of the principal cereals; variations of yield; production according to districts; distribution of the yield; home-consumption; varieties of grain.

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**A** GENERAL view of the distribution of land according to its uses and with reference to ownership is given in Chapter III. On one of the maps appended to that chapter is indicated the arable lands in percentage of the whole area according to governments. In Chapter IV, treating of the systems of cultivation, the question of the rotation of crops is discussed, where appears an enumeration of the districts in which the systems of farming called respectively many-field, three-field, long-rest and clearing prevail.

The proportion of land under crops to the total area of arable fields clearly depends upon the predominance of one or the other of these systems of rotation. In the case of the many-field, or three-field rotation, that part only of the arable land remains fallow which is being prepared for sowing with winter grain in the autumn. Under the long-rest system of farming there further remain unsown wastes, lands at rest, or freshly broken-up steppes; and under forest-system, clearings in course of preparation for sowing. In localities with a prevailing three-field farming, about two-thirds of the arable land are under crops, one-third remaining in fallow. In fact in all the governments, with the exception of the extreme north, the Baltic provinces and the southern and south-eastern governments, from sixty to seventy per cent of the total extent of the arable lands are sown. Under the many-field system, which holds undisputed sway in the Baltic provinces, less land necessarily remains at rest than with the three-field system, and therefore usually more than seventy per cent of all arable lands are under crops. Finally, under the long-rest system of farming, a considerable portion of the tillable area remains fallow, and therefore, especially in the east and south-east of Russia, less than fifty per cent of the arable land is generally sown, in the government of Orenburg even less than thirty per cent. The same feature is likewise observed here and there in the north of Russia, for example in the Olonets government, due to the predominance of the forest-system of cultivation.

Among the cereals, of the area annually under cultivation in European Russia, the first place belongs to rye, the second to oats, the third to wheat, and the fourth to barley. These figures are duly set forth in the following table:

## Areas under crops in the fifty governments of European Russia.

	D e s s i a t i n e s .			Per cent of total area sown.		
	Total.	Peasants.	Landowners.	Total.	Peasants.	Land-owners.
1. Rye . . . . .	23,929,445	18,160,239	5,769,206	37·0	38·7	32·2
2. Wheat. . . . .	10,721,115	6,964,390	3,756,725	16·6	14·9	21·0
a. winter . . . . .	2,547,103	1,052,582	1,494,521	3·9	2·3	8·3
b. spring . . . . .	8,174,012	5,911,808	2,262,204	12·7	12·6	12·7
3. Oats. . . . .	12,922,127	9,356,404	3,565,723	19·9	20·0	19·9
4. Barley . . . . .	4,612,754	3,561,141	1,051,613	7·1	7·6	5·9
5. Buckwheat . . . . .	3,665,226	2,652,647	1,012,579	5·7	5·7	5·7
6. Millet . . . . .	2,432,749	1,839,563	593,186	3·3	3·9	3·3
7. Maize . . . . .	556,442	392,073	164,369	0·9	0·9	0·9
8. Spelt . . . . .	344,444	318,906	25,538	0·5	0·7	0·1
9. Peas . . . . .	831,011	595,082	235,929	1·3	1·3	1·3
10. Potatoes . . . . .	1,375,176	1,066,615	308,561	2·1	2·3	1·8
11. Other cereals . . . . .	3,273,472	1,858,268	1,415,204	5·1	4·0	7·9
12. Total. . . . .	64,663,961	46,765,328	17,898,633	100	100	100

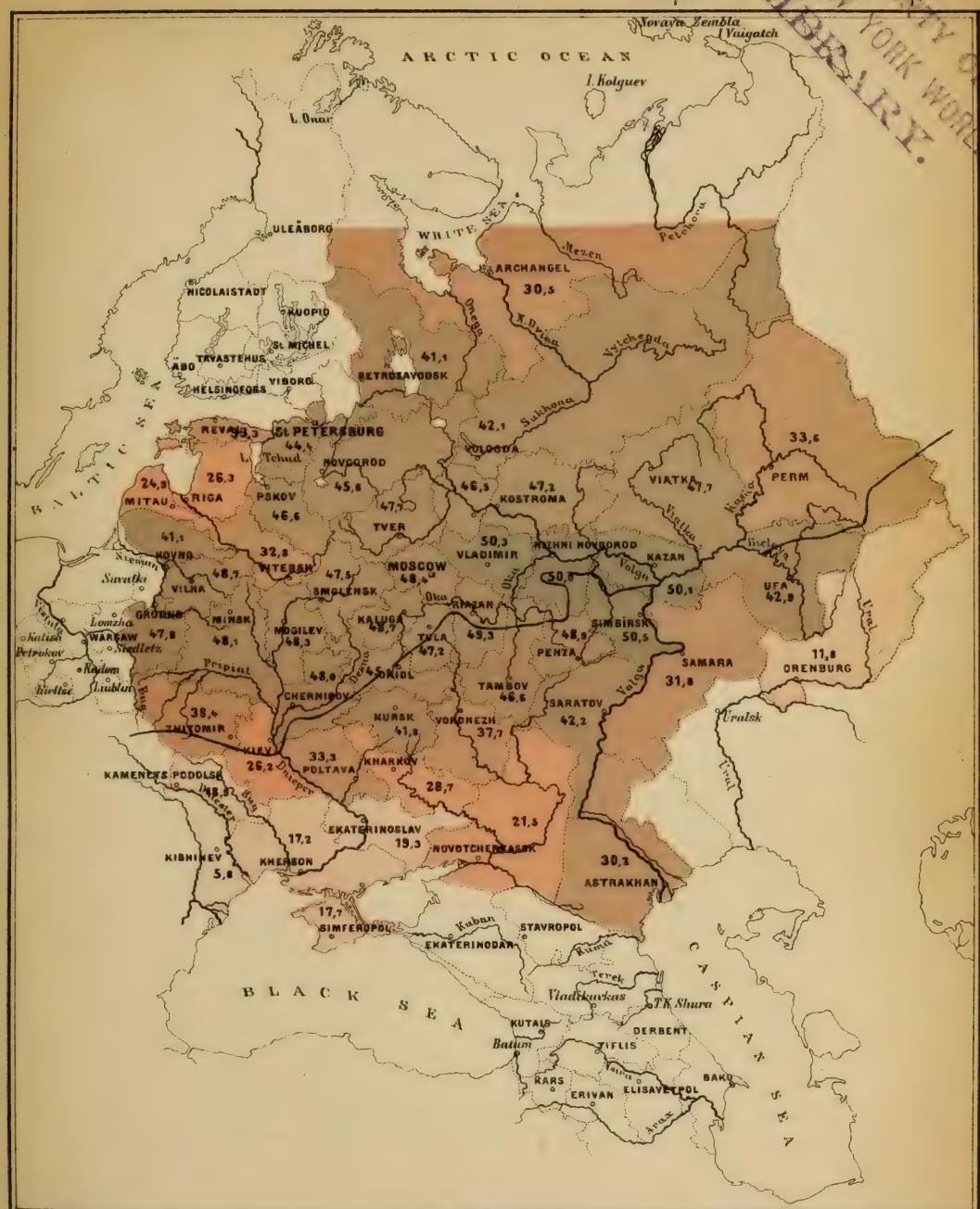
The crops of the principal breadstuffs above enumerated are very unequally distributed in the various places. Some are limited to definite localities, others are extensively sown and are the chief crop in some places, while in others they are of secondary importance. Rye, as appears from map № 1, occupies almost half the sown area in the centre and north of Russia, and an even greater proportion in the governments of Vladimir, Kazan and Simbirsk. This grain is of least importance in the extreme south and south-east of Russia. Thus for example, in Bessarabia it covers only 5·8 per cent, in that of Orenburg 11·8 per cent of all ploughed lands.

Wheat as shown on map № 2, occupies but a trifling area, less than one per cent in the extreme north and north-west of Russia, as also in the central non-Chernoziom governments. Again in the western, Baltic and central, or northern Chernoziom governments, this cereal plays rather a second role, and that, for the most part, only on the farms of landowners. In the extreme south and south-east, however, the cultivation of wheat assumes the first place, from one-third to one-half of all the lands under crops being sown with this grain. At the same time it is to be observed, that in the western half and in the central, winter wheat is chiefly sown; in the extreme south spring wheat predominates, while in the east no winter wheat is sown, the cultivation being almost exclusively confined to the spring varieties. In short the chief centres of spring wheat are the south and south-east of Russia, while winter wheat is grown in the south-western governments, such as Kiev, Podolsk and Volhynia.

With the exception of the wheat region just indicated, occupying the south and south-west of Russia, and also the Baltic governments and Archangel, the first place in the spring crops belongs everywhere to oats, just as in the same localities rye takes the first place among the winter cereals. As map № 3 shows, in almost all the non-Chernoziom governments except Archangel, in the western and Baltic provinces, and in Oriol, Tula

## AREA UNDER RYE IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE

## Chapter VI. Breadstuffs Map N° 1.



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Average yearly proportion of land under rye in percentage of the cultivated area

Below 10%

10 — 20%

$$20 \leftarrow 30^{\circ}a$$

30 - 40%

40 - 50%

*above 50°*

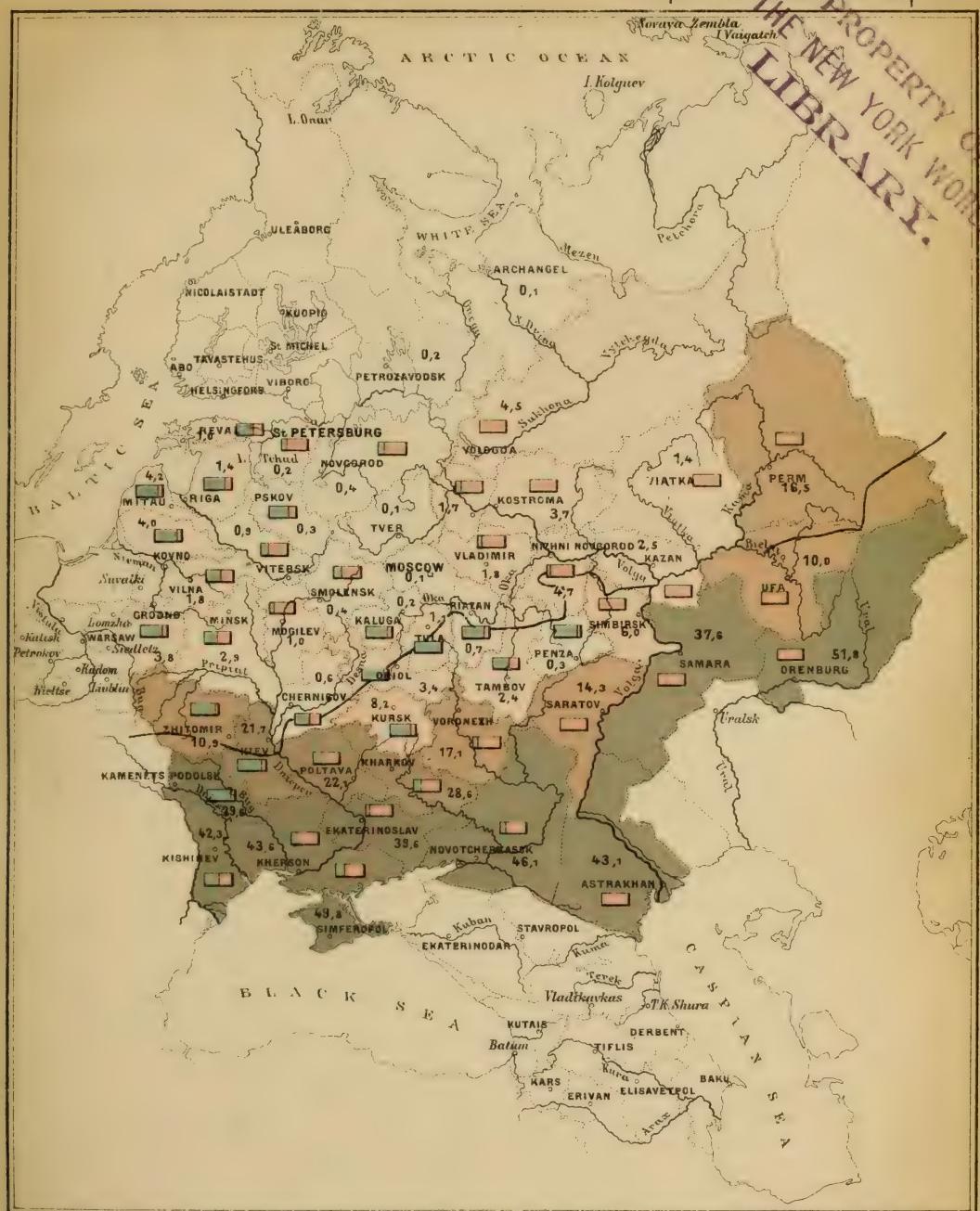
The figures on the map show the percentage with greater precision.



# AREA UNDER WHEAT IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE.

Chapter VI. Breadstuffs Map №2.

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Cartographical works A. Jlyne S.P.B.

Average yearly proportion of land under wheat in percentage of the cultivated area

Below 1%	1 - 5%	5 - 10%	10 - 20%	20 - 30%	above 30%
[Blank]	[Blank]	[Blank]	[Blank]	[Blank]	[Blank]

The coloured (blue & red) parallelograms show the surface under winter (blue) and spring (red) wheat in proportion to the whole area of each government.

The figures on the map show the percentage with greater precision.



AREA UNDER OATS IN PERCENTAGE OF THE  
WHOLE CULTIVATED SURFACE.

Chapter VI Breadstuffs Map No. 3.

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**Cartographical works A. Jlyne S.P.B.**

Average yearly proportion of land under Oats in percentage of the cultivated area

*Below 10%*

10—20%

20--30%

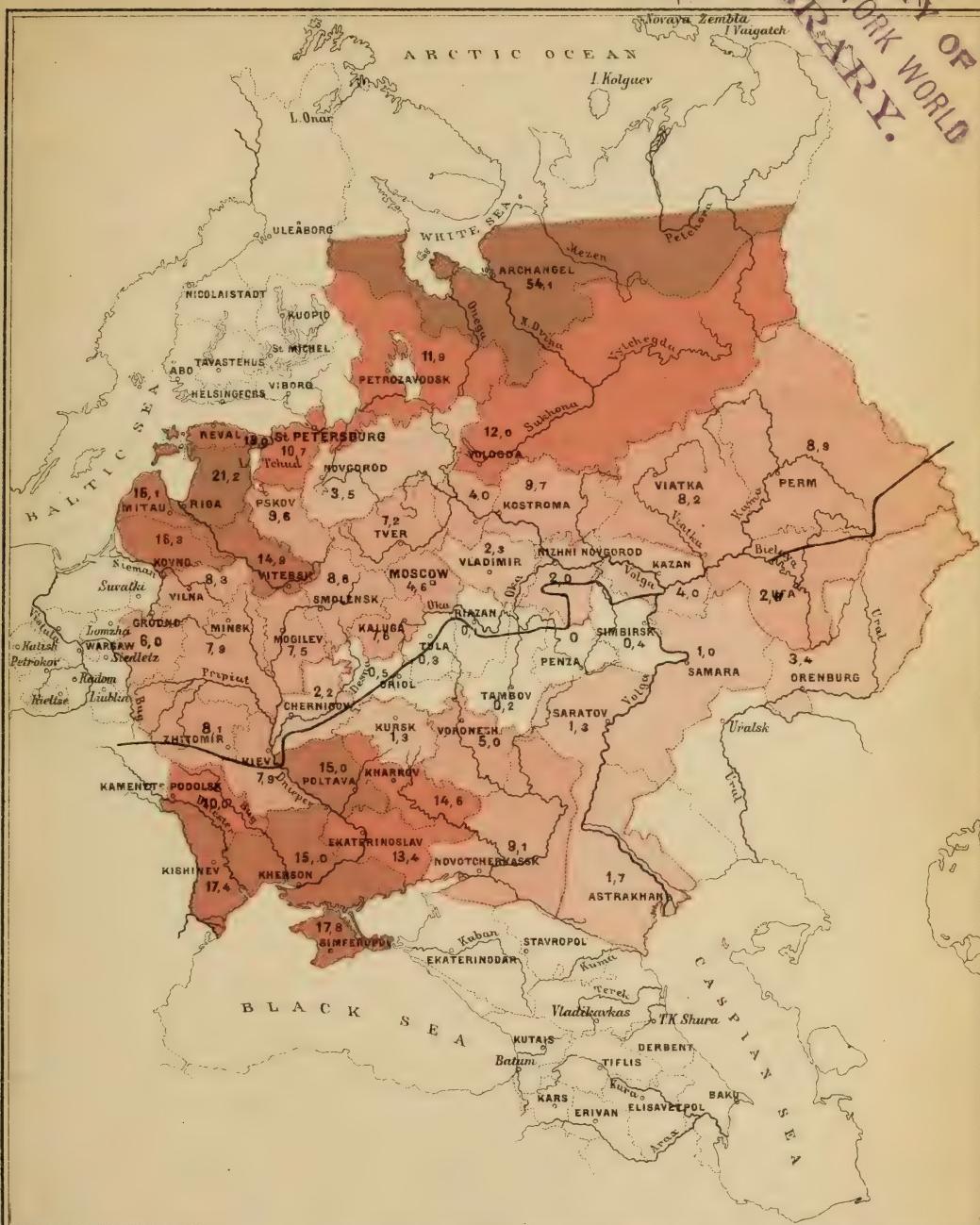
above 30%

The figures on the map show the percentage with greater precision.



# AREA UNDER BARLEY IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE

Chapter VI. Breadstuffs Map No. 4.



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Cartographical works A. Jlyne S.P.B.

Average yearly proportion of land under Barley in percentage of the cultivated area.

Below 1%

1 — 5%

5 — 10%

10 — 15%

15 — 20%

above 20 to 54%



and Riazan in the Chernoziom zone, some one-third and more of the whole area sown is under oats. In the Novgorod government the proportion even reaches 42·9 per cent. The smallest area occupied by oats in relation to other kinds of grain, less than ten per cent, is found in the extreme south in all the Novorossisk or southern steppe governments and in Astrakhan, as also in the extreme north in Archangel.

The cultivation of barley is the reverse of that of oats, as clearly appears from map № 4. Barley shows its greatest proportion, compared with other cereals, namely 10 to 20 per cent in the extreme north and south, in the southern or steppe governments, in the Baltic provinces and in some of the adjacent districts. On the other hand in the greater part of the central agricultural region it is almost entirely unsown, or if so, only in very insignificant quantities. As an example it may be mentioned that the cultivation of this cereal is least of all known in the governments of Penza and Riazan, there occupying less than one-tenth per cent of the cultivated area. On the other hand it is most widely sown in Archangel where it predominates over all other grains, occupying more than 54 per cent of the whole sown area.

The above-mentioned cereals are cultivated almost universally, although in some governments very slightly. To the number of breadstuffs almost generally cultivated must be further added one not belonging to the order of cereals, namely the pea. This leguminous plant is met with in the fields of every government except Archangel, taking up from 0·1 to 4·4 per cent of the ploughed area. Among the remaining cereals, no slight importance must be assigned to buckwheat, millet, maize and spelt, although these grains, chiefly in consequence of great sensitivities to climate have more or less restricted regions of distribution. Of the kinds mentioned, the first place and the most extensive region of distribution undoubtedly belong to buckwheat. This is evident from map № 6 wherfrom it appears that this grain occupies of tillable lands from 5·7 in Vilno, to 26·7 per cent in Chernigov, in the central zone of Russia. This area extends from west to east, embracing without distinction alike Chernoziom and non-Chernoziom localities, its centre coinciding with lands which constitute the transition from Chernoziom to other soils. To the south and north of this belt the relative importance of buckwheat continually decreases with the distance therefrom. In the extreme north (Archangel, Olonets and Vologda) it is nowhere cultivated in consequence of the severity of the climate, the same fact being observed in the extreme south (Tauris and Astrakhan), as a result of drought and high summer temperatures.

Millet is grown in more or less considerable quantities as appears from map № 5, over the whole extent of the Chernoziom zone, while its maximum culture is reached in Tambov, 11·6 per cent, and Astrakhan 10 per cent of the sown area. The cultivation of millet beyond the limits of the Chernoziom zone is observed also in localities conterminous with that formation, but only on a very small scale. This cereal, which from its being extremely sensitive to spring frosts is ordinarily sown later than other spring crops, does not ripen further north.

Maize and spelt, as appears from map № 7, have the most limited localities of cultivation of all cereals. The former, besides the Caucasus concerning which, as already stated, exact information upon landed property is not available, plays an exceedingly important part in Bessarabia, where it occupies 24·6 per cent of the sown area. Maize is also grown to a considerable extent (6·7 per cent) in Podolsk, the neighbouring government of Bessarabia, and to a yet less extent in Kiev, as likewise in New Russia and

Little Russia. The cultivation of spelt is concentrated in the east of Russia along the middle course of the Volga and partly along the rivers Kama and Biala. The first place, as far as concerns the quantity of spelt, is held by the governments of Ufa and Kazan, where 7·1 per cent and 5·6 per cent respectively are sown; next in importance are the geographically related governments of Simbirsk and Samara with more than 2 per cent. The governments which immediately surround this comparatively limited area also cultivate this grain but to an even less extent.

One important breadstuff still remains to be considered, the potato, which plays a by no means insignificant part in certain localities both in husbandry and with reference to the national food supply. Like the grain breadstuffs, it is also employed for distilling purposes. As appears from map № 8 potatoes are the most extensively cultivated in the west of European Russia, in the Baltic and in the western governments, occupying five to six per cent of the whole area under crops. Among these localities the first place belongs to Estonia, with 14·8 per cent.

Almost an equal proportion of the land is planted with potatoes in the Petersburg and Moscow governments because they are easily marketed. Finally more than five per cent of the area sown is occupied by potatoes in the Yaroslav government in which the manufactures of potato flour and starch are highly developed. In proportion to the distance from the Baltic and western governments, the relative extent of lands under potatoes continually diminishes to the south and east. In the south in the Novorossiisk and conterminous governments, one to two per cent of the cultivated area is under potatoes, in the east less than one per cent, a proportion which falls in Perm even to '3 per cent.

Besides the chief cereals considered above, and occasionally bean and green crops, field culture also embraces in certain places beet, tobacco, flax, hemp, rape and its varieties *repak* and *surepkä*, sunflower, poppy, mustard and other commercial and oil-yielding plants, which are discussed in the following chapters devoted to special cultures.

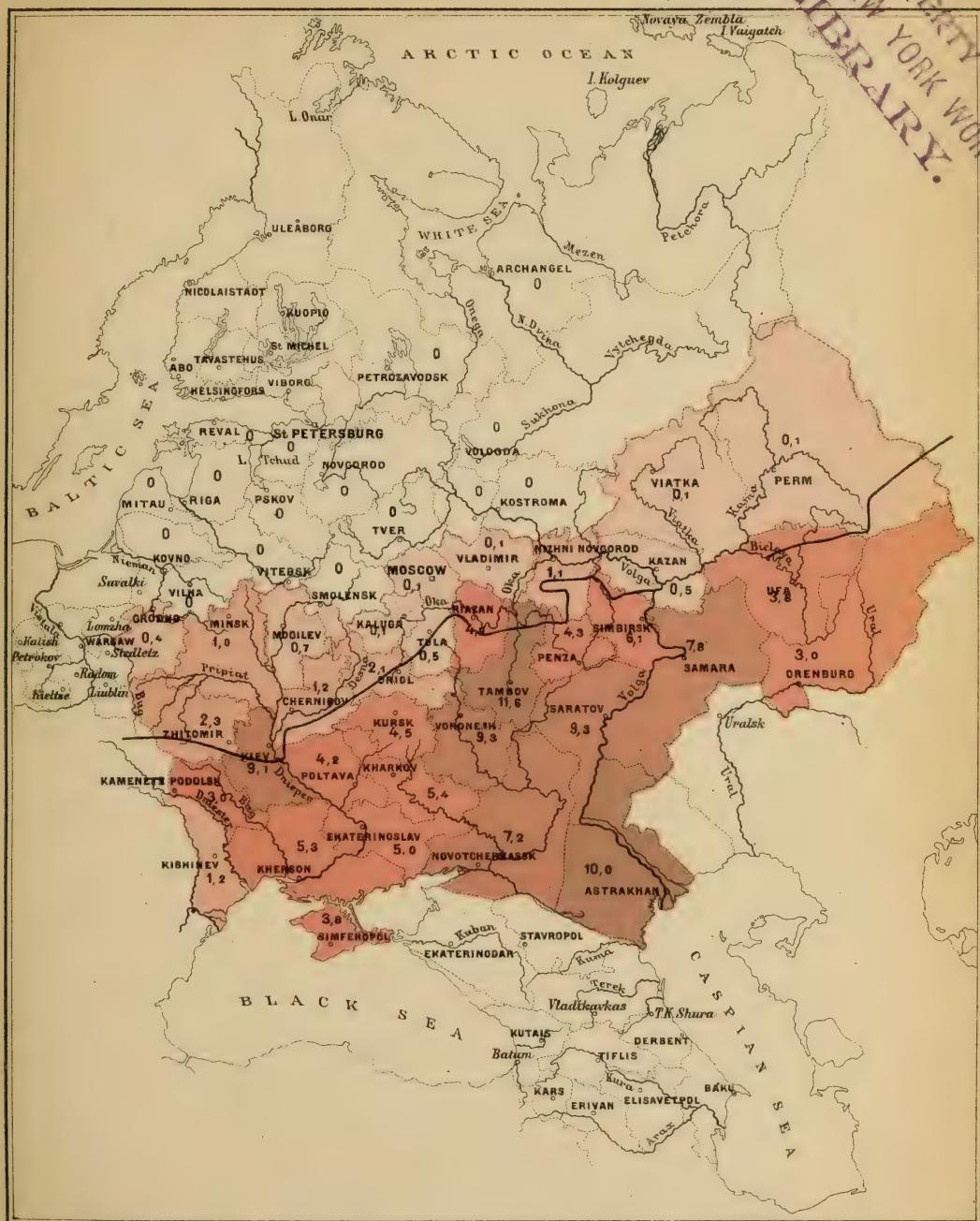
Map № 9, appended to the present chapter, shows the division of Russia into regions, according to the predominance of the plant as the subject of field cultivation. This map, drawn by Prof. A. Fortunatov, makes it possible to judge at a glance of the general characters of farming in relation to the most important productions of agriculture in each separate government.

Such is the distribution of the cultivated area among the different cereals in European Russia. It must however be observed that the total quantity of breadstuffs produced is dependent not only upon the area sown but also upon the productive qualities of the soil. It is therefore necessary to pass to the consideration of this question before speaking of the total crops. The yield from a determinate area is dependent on the one hand upon the conditions of soil and climate, and on the other upon the methods of cultivating the soil. The productiveness may either be estimated in relation to area, or to the quantity of seed sown, which for one and the same plant differs widely in different localities in Russia. It is sufficient to note that in the steppe zone the quantity of seed sown of the chief cereals for a given area is only half as great as in the non-steppe localities, and accordingly the yield per dessiatine in the steppe region proves much lower than in the non-Chernoziom districts. The production on the other hand, in relation to the quantity of seed sown on the steppes, equals or even exceeds that for situations outside this region.

# AREA UNDER MILLET IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE.

Chapter VI. Breadstuffs Map №5.

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Average yearly proportion of land under Millet in percentage of the cultivated area.

*Is not  
grown*

*less than  
1% is grown*

*1—3%*

*3—7%*

*7—10%*

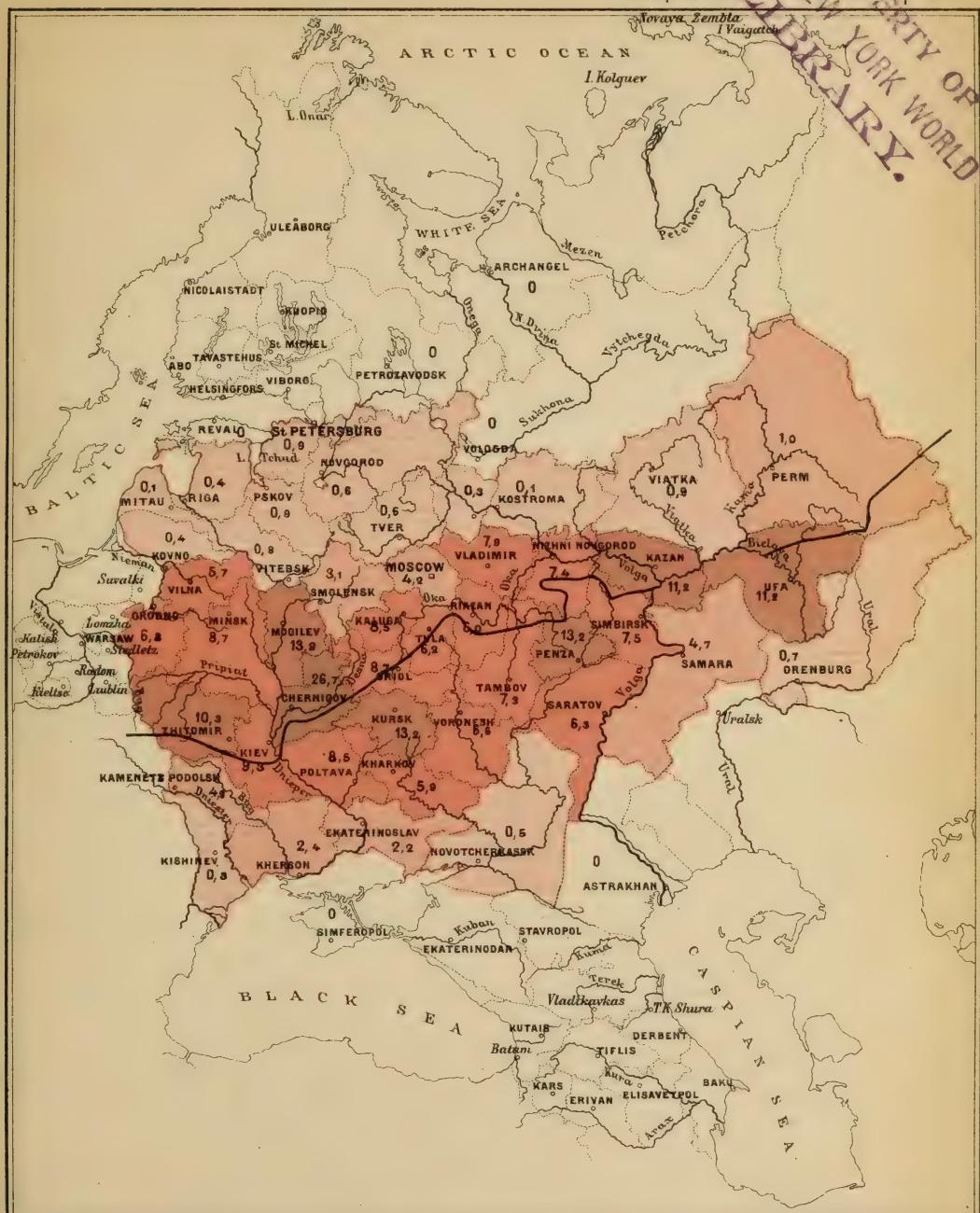
*above 10%*



# AREA UNDER BUCKWHEAT IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE

Chapter VI. Breadstuffs Map №6.

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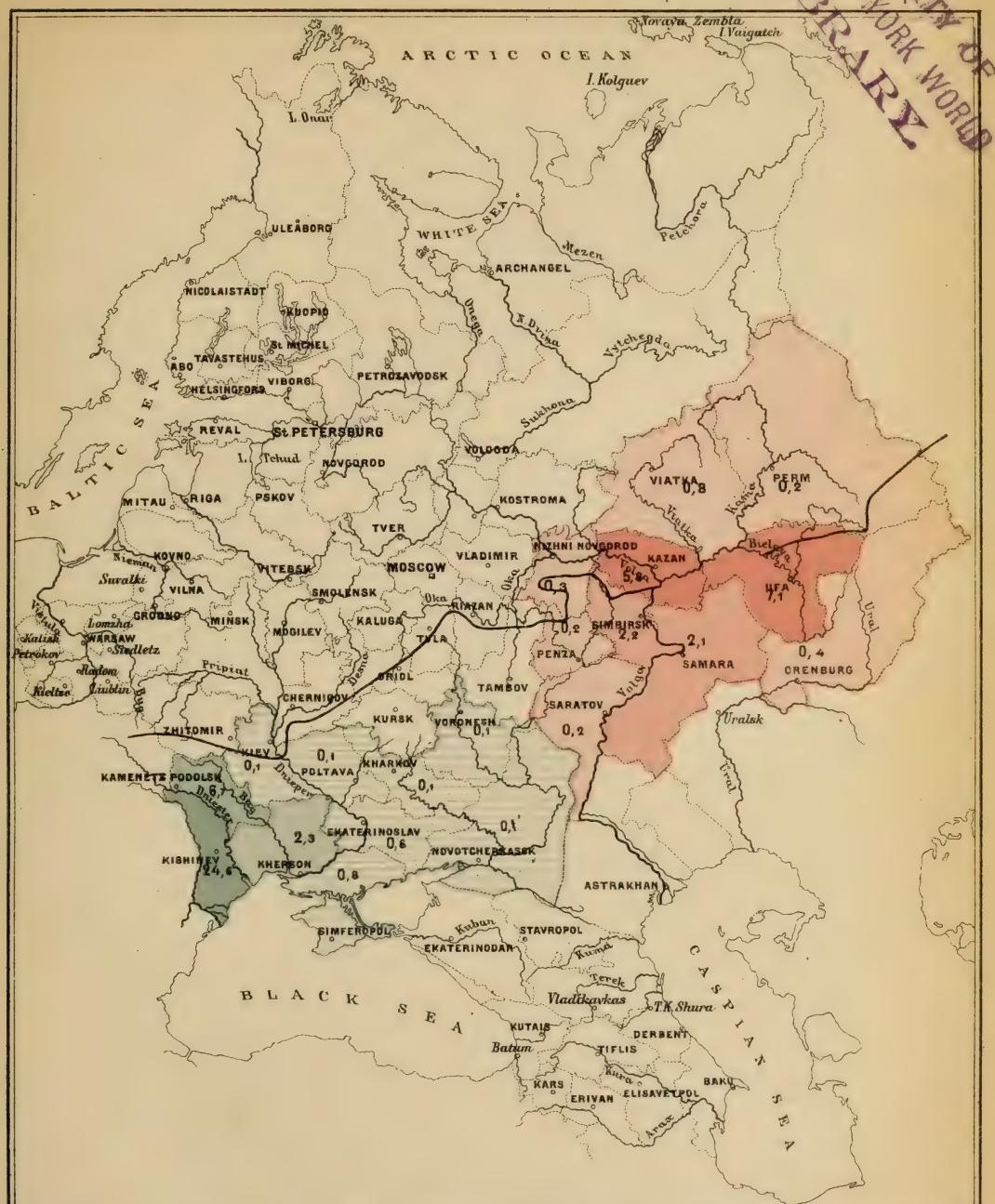
Average yearly proportion of land under Buckwheat in percentage of the cultivated area.

Is not grown	less than 1% is grown	1—5%	5—10%	10—20%	above 20%



AREA UNDER INDIAN CORN AND SPELT IN  
PERCENTAGE OF THE WHOLE CULTIVATED SURFACE

~~Chapter VI. Breadstuffs Map N° 7.~~



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Average yearly proportion of land under Indian corn in percentage  
of the cultivated area.

*Below 1%*

1—5%

5-20%

*above 20%*

*Below 1%*

## Spelt

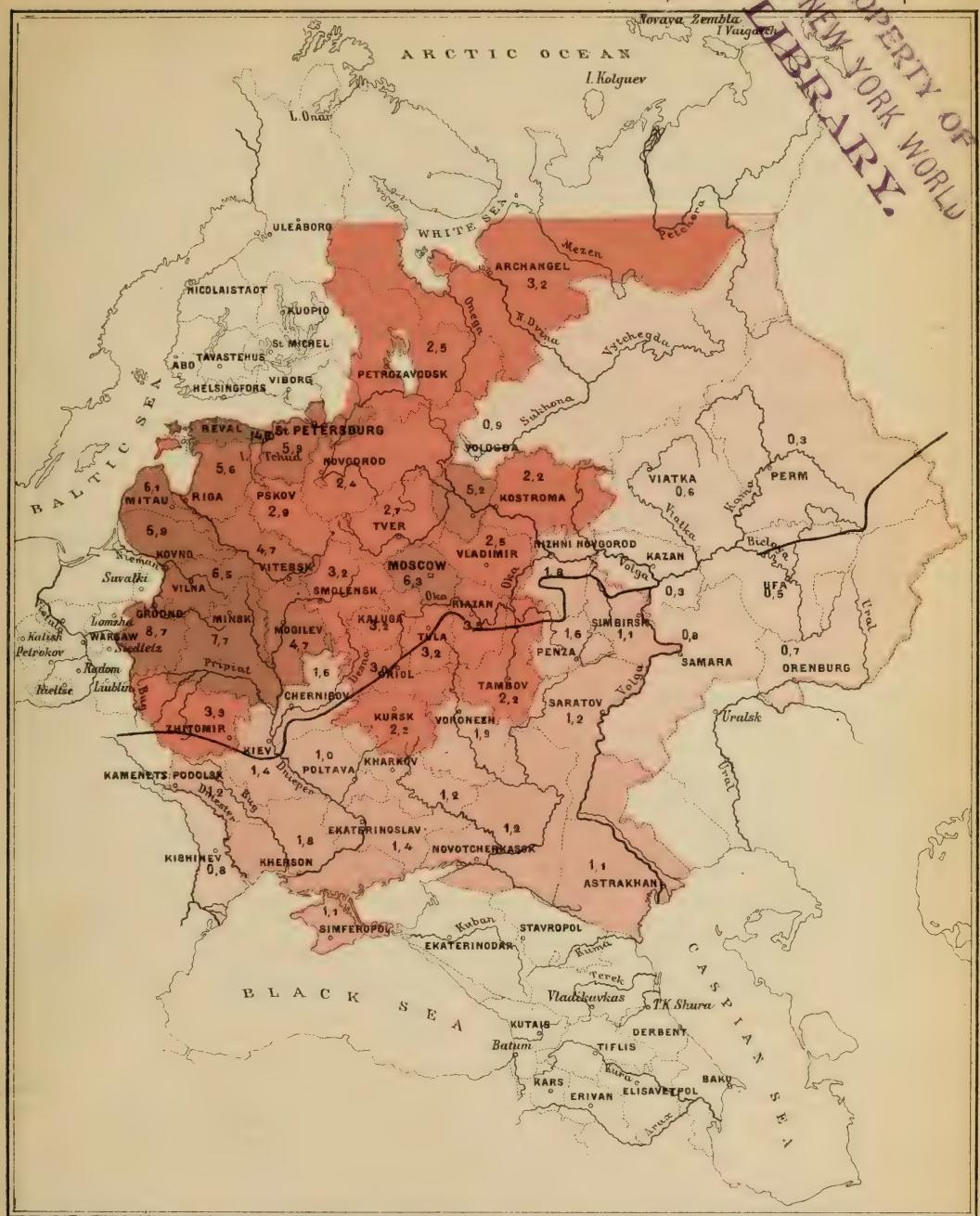
*above 5%*



# AREA UNDER POTATOES IN PERCENTAGE OF THE WHOLE CULTIVATED SURFACE

Chapter VI. Breadstuffs Map №8.

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Average yearly proportion of land under potatoes in percentage of the cultivated area.

Below 1%

1 — 2%

2 — 4%

4 — 6%

6 — 10%

above 10%



An idea of the productiveness of different cereals is given, in relation to the area sown for rye on map № 10; for spring wheat, № 11, oats, № 12, and potatoes, № 13. These maps show that the yield from every bread-crop reduced to the unit of area is lowest in the south of Russia, in the steppe zone. The greatest yield on the other hand in the case of almost all bread-crops is in the Baltic provinces where the most perfect methods of cultivation are employed. Next to the Baltic provinces in importance come the non-steppe Chernoziom districts, above all, the central agricultural region and the government of Kiev. In fertility of soil, in the non-Chernoziom districts, the government of Yaroslav stands first. The yield of the potato varies little in the non-steppe Chernoziom zone and in the non-Chernoziom governments.

A comparison of the yield of cereals in different countries, taking into consideration the density of population, naturally leads to the conclusion that the largest crops and the most improved systems of farming are to be met with in thickly populated regions. Countries more sparsely settled on the other hand naturally present primitive methods of farming resulting in a much less yield per acre. Consequently the yield in countries which produce a surplus is for the most part much lower than in those which are incapable of producing enough grain to suffice for the wants of their own people. Thus, for example, in such a country as Russia which throws considerable quantities of its grain surplus upon the world's market, and is distinguished by somewhat primitive methods of farming, the yield can be compared only with such other countries, as lie under somewhat similar conditions. For this reason the average yield of the chief cereals in the fifty governments of European Russia is here placed side by side with that in the United States.

The calculation of the average yield for the whole country of a given area may be performed in two different ways. Either the general average may be deduced from the averages of the several provinces, or the total yield may be divided by the total area sown and the general average be thus found. The results obtained by these two methods do not coincide. The southern and eastern governments produce the greatest quantities of grain and the yield per acre is there comparatively low, and therefore the average obtained by the first method will be higher than that by the second. Furthermore, the yield on private estates is for the most part higher than that on peasant farms; and as the area of peasant lands is much the greater this difference is still further increased. The average yield for the United States is reckoned by the first method. The figures for Russia, calculated by both methods, have been inserted in the table below. The first method has been applied to the cases of landholders and peasants separately.

## Yield of Breadstuffs.

	Russia.					United States.	
	Average yield in chetverts per dessiatine.			First method.		Second method.	
	Mean.	Land-holders.	Peasants.	Mean.	Variation by governments.	Mean.	Average in chetverts per dessiatine, last 10 years.
Rye . . . . .	5·3	5·8	4·8	4·1	2·9—6·9	5·4	2·1—7·2
Winter wheat . . . . .	5·0	5·3	4·6	4·1	2·8—6·9	5·4	2·6—8·8
Spring      " . . . . .	4·4	4·6	4·2	3·1	2·5—6·5	5·4	4·3—16·4
Oats . . . . .	7·5	8·0	6·9	6·9	3·8—9·6	12·1	4·3—12·4
Barley . . . . .	5·7	6·0	5·4	4·9	3·9—7·7	9·9	4·3—12·4
Peas . . . . .	—	—	—	3·4	2·0—6·0	—	—
Buckwheat . . . . .	3·6	3·8	3·4	3·1	1·2—4·3	5·8	3·9—9·5
Millet . . . . .	—	—	—	3·3	1·9—5·4	—	—
Maize . . . . .	—	—	—	5·4	3·1—7·2	11·0	4·3—14·9
Potatoes . . . . .	—	—	—	34·2	17·9—62·2	34·6	2·5—53·2

From this table it is seen that the mean yield of potatoes, rye, and probably of winter wheat, is almost identical in Russia and in the United States. The yield of spring cereals on the other hand in the United States exceeds that in Russia by more than fifty per cent.

Such are the average yields of the chief grains in European Russia taken as a whole, and in its different subdivisions. The figures quoted represent however merely the arithmetical means of a series of figures expressing in their turn the harvests for the individual years of the decade. In these years there were both very plentiful and very scanty harvests. The result then is a somewhat abstract quantity. It is true that taking the whole of Russia into the calculation very considerable deviations from the mean rarely occur. The majority of harvests, with the exception of such extreme cases as the unusually disastrous year of 1891, or such plentiful years as 1887 and 1888, when taken year by year, differ very little from these averages. On the other hand, in the greater part of the Chernoziom zone, and particularly in its steppe localities, average harvests are seldom seen. In this region the production of a given kind of grain is more frequently very abundant or very scanty. The yield even for whole governments is sometimes less than half, and some times more than double the average. It is not therefore remarkable that in more limited regions the difference between the lowest and highest yields is still more considerable. In such cases the harvests fluctuate between complete failure and a fourfold crop.

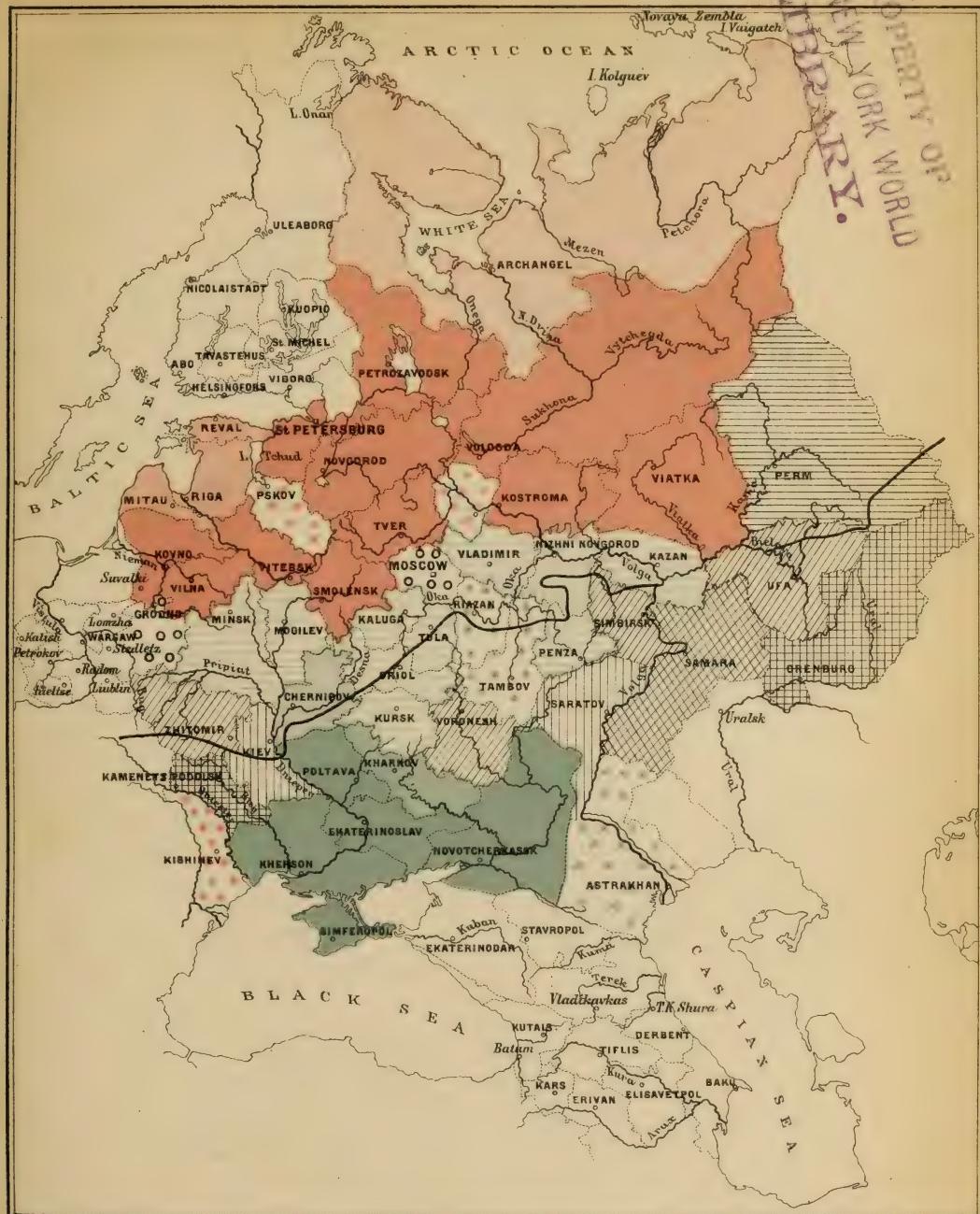
For all Russia the yields of every kind of grain, and separately of rye, wheat and oats, for the last twelve years, present the following deviations from the average.

## Yield in percentage of a ten-year average:

Year.	Rye.	Wheat.	Oats.	All sorts.
1880 . . . . .	73·6	65·6	89·5	83·7
1881 . . . . .	89·1	106·1	107·4	103·7
1882 . . . . .	88·5	95·8	100·1	96·6

## PREVAILING CROPS.

Chapter VI. Breadstuffs Map N<sup>o</sup>. 9.



Del. by A. Fortunatov

Cartographical works A.Jlyne S.P.B.

Division of cultivated area into provinces according to the three prevailing crops (1886)

### I. Province ( rye,-oats,-barley )

1. Rye, 2. Oats, 3. Barley  
 1. Rye, 2. Barley, 3. Oats

1. Barley, 2. Rye, 3. Oats

- II. Province ( rye, oats, buckwheat )**

**VII Province** (rye, oats, millet)

VII. Province (rye, oats, millet) 1. Rye, 2. Oats, 3. Millet.

### III. Province ( rye,-oats,-wheat )

- |  |                           |
|--|---------------------------|
|  | 1. Rye, 2. Oats, 3. Wheat |
|  | 1. Rye, 2. Wheat, 3. Oats |
|  | 1. Wheat, 2. Rye, 3. Oats |
|  | 1. Wheat, 2. Oats, 3. Rye |
|  | 1. Oats, 2. Rye, 3. Wheat |

VIII. Province (Rye, Wheat, Millet)

	1. Wheat, 2. Rye, 3. Millet
--	-----------------------------

#### IV. Province (rye, wheat, barley)

1. Rye, 2. Wheat, 3. Barley  
 1. Wheat, 2. Rye, 3. Barley  
**V. Province (rye-oats-flax)**  
 1. Rye, 2. Oats, 3. Flax  
**VI. Province (rye,oats,potatoes)**  
~~88~~ 1. Rye, 2. Oats, 3. Potatoes  
**VII. Province (wheat,corn,barley)**  
 1. Wheat, 2. Corn, 3. Barley

*Boundary of provinces*



# AVERAGE YIELD OF RYE.

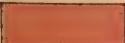
Chapter VI. Breadstuffs Map N°10.



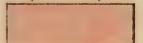
Det. by D. Semenov.

Cartographical works A.Jlyne S.P.B.

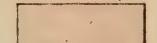
Below 2 3/4



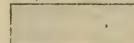
2 7/8 - 3 1/2



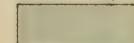
3 1/2 - 4 1/2



4 1/2 - 5 1/2



5 1/2 - 6 3/4



above 6 3/4



In tchelverts per dessiatine

The upper figures show the average yield in tchelverts per dessiatine.

The lower figures show the average yield in bushels per acre.



# AVERAGE YIELD OF SPRING WHEAT

Chapter VI. Breadstuffs Map №11.

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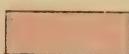


Del. by D. Semenov.

Cartographical works A. Jlyne S.P.B.



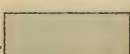
Below 2.7



2.7 - 3.6



3.7 - 4.5



4.6 - 5.5



5.5 - 6.7

In chetverts per dessiatine

The upper figures show the average yield in chetverts per dessiatine  
The lower figures show the average yield in bushels per acre



## AVERAGE YIELD OF OATS

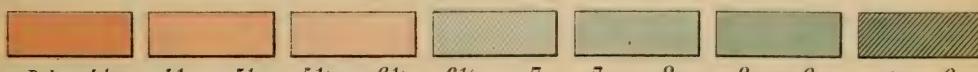
**Chapter V Breadstuffs, Map N°12.**

The title page of the map features the text "PROPERTY OF THE NEW YORK WORLD LIBRARY." in large, bold, black letters at the top. Below this, it says "V. Breadstuffs, Map No. 12." A small note "Augatech" is written near the bottom left. The map itself shows a detailed outline of the United States and parts of Canada and Mexico, with various regions shaded in different colors.



Del. by D. Semenov.

Cartographical works A. Jlyne St.Pbg.



*Below*  $4\frac{1}{2}$     $4\frac{1}{2} - 5\frac{1}{2}$     $5\frac{1}{2} - 6\frac{1}{2}$     $6\frac{1}{2} - 7$     $7 - 8$     $8 - 9$    *above*  $9$

*in chelverts per dessiatine*



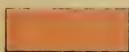
## AVERAGE YIELD OF POTATOES.

Chapter VI. Breadstuffs. Map N°13.



Del. by D. Semenov

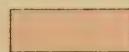
Cartographical works A.Jlyne St.Pbg.



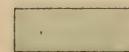
*Below 20*



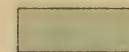
20-30



30 - 40



40 — 50



above 50

*in chetverts per dessiatine*



Year.	Rye.	Wheat.	Oats.	All sorts.
1883 . . . .	79·6	87·5	100·1	90·7
1884 . . . .	102·9	106·7	93·4	97·7
1885 . . . .	105·2	71·1	72·5	82·4
1886 . . . .	98·1	65·1	104·5	96·2
1887 . . . .	110·6	113·4	108·7	109·9
1888 . . . .	111·1	125·4	99·8	110·7
1889 . . . .	83·9	81·4	91·8	84·1
1890 . . . .	95·1	85·1	95·6	95·2
1891 . . . .	70·4	67·1	75·3	73·6

It appears from this table that wheat shows the greatest fluctuations in the harvest from year to year, in showing under-yields of 34·9 per cent and over-yields of 25·4 per cent of the mean, or more than half the general average. This is clear when it is remembered that the principal regions devoted to the cultivation of wheat are comparatively limited and are in localities where harvests of all kinds are subject to the greatest annual fluctuations. For rye these deviations are less considerable, — 29·6 and + 11·1, only a little more than 40 per cent; for oats, — 27·5 and + 8·7, or a variation of 36 per cent or more than one-third of the average, while for all kinds of grain the extremes are — 26·4 and + 10·7, showing a variation of about 37 per cent. These figures further show that in the total for the whole of European Russia the under-yields are generally more considerable than the over-yields. In other words the deviation from the average in years of very good harvests, has never attained such considerable dimensions as in years of great scarcity, as for example the years of 1880 and 1891 which were the worst for the last twelve years.

Some idea of the fluctuations in the rye harvests according to governments, from year to year, may be obtained from map № 14, which shows the difference between the highest and lowest yield in per cent of the mean for the last eleven years. This map indicates that the greatest annual variations occur in the New Russian governments or southern steppes, excepting Bessarabia. Thus in the government of Ekaterinoslav the difference between the highest and lowest yield reaches 181 per cent, and in the Don Territory 162 per cent, or exceeds the average by more than one and one-half times. The southern steppe governments are followed by some other Chernoziom governments and the whole of the regions along the lower Volga and beyond, where this range exceeds the mean yield. Next in order come all the remaining Chernoziom governments except Oriol, where the range everywhere amounts to more than 70 per cent. Outside the Chernoziom zone the variations of the harvests are much less considerable and hardly anywhere exceed 70 per cent. In the extreme north of Russia and in some Baltic governments they are not more than 50 per cent reaching the minimum in Archangel where they are only 39 per cent.

As opposed to the general totals for the whole of European Russia in many governments the deviations beyond the average yield are more considerable than those below. This is to be expected as the units being smaller the limits of variation, although extremely different for different localities, must also on the whole be more considerable. If such deviations are calculated for individual estates they prove to be still greater and the variations beyond the mean will be particularly great, especially in those

localities where the yield changes the most. The reason is simple, for when there is a total failure of crops the deviation cannot exceed 100; while when the yield is especially good it can reach 200 or even 300 per cent. The deviations of rye from the average in both directions according to separate governments are represented by diagram № 1, from which it is seen that the variations above are greater than those below the average, and that they are both generally more strongly developed in the Chernoziom than in the non-Chernoziom governments. In the majority of the former districts deviations of more than 50 per cent are met with, while among the latter such a deviation above the average occurs only in one government, and similar deviations below the average are not found. At the same time in non-Chernoziom governments deviations below the mean yield, even exceeding 25 per cent, are met with in but very few cases, while such deviations above the mean have been observed in the majority of governments. In other words the Chernoziom governments present very bad and very good crops, while the non-Chernoziom governments present neither of these extremes.

This difference in the harvests between the Chernoziom and non-Chernoziom governments, and in general the considerable range of the yield in Russia compared with other countries, is chiefly explained by the conditions of climate and by the primitive methods of farming in the Chernoziom governments. With their natural fertility of soil and limited use of manures, especially in the steppe zone, the climate is of decisive importance. The difference between the Chernoziom and non-Chernoziom zones in respect to poor crops is explained by the fact that droughts are exceedingly frequent and severe in the former, while in the latter they are very rare and never extreme, and by the fact that in the non-Chernoziom governments the dressing of the fields with manure is universal, while in the Chernoziom zone the fields are manured only in the non-steppe regions, and even there to a much less degree. The importance of this fact is evident on considering that the variations in yield in the non-steppe Chernoziom governments are smaller than in the steppe region where manuring of the fields is almost unknown.

As far as concerns variations beyond the average in the Chernoziom, and especially in the steppe governments, they depend upon the natural fertility of the soil, yielding when aided by favourable meteorological conditions, plentiful crops without manuring, and even with indifferent tillage.

Droughts are not the only causes of bad harvests. In consequence of the severity of the climate of European Russia the winter crops, when there is a lack of snow, sometimes freeze out. Further the crops are often injured by late spring and early autumn frosts. However, as proved by the slight variation of the harvests in the extreme north of Russia and by their enormous fluctuations in the south, the chief climatic agent in the harvest is the sufficient or insufficient quantity of atmospheric moisture. A more minute investigation of the influence of the weather upon vegetation shows that in the majority of Chernoziom governments often two or three abundant showers falling at the right time may assure a plentiful yield of the principal crops, while an absence of rain at critical moments, for example during the filling of the grain, is the cause of a more or less considerable failure. In general it may be averred that the more primitive the system of farming and the more continental the climate, the greater the variation of the harvests.

In consequence of the fact that agricultural statistics in Russia have latterly made remarkable progress under ever-improving methods of collecting data upon the harvests, it is impossible to institute a comparison of the yields over any considerable period of

YEARLY DEVIATION IN PERCENTAGE OF THE MEAN YIELD OF RYE  
FOR A PERIOD OF 11 YEARS (1881-1891)

Chapter VI. Breadstuffs. Map N°12.

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time. It is therefore impossible to arrive at any conclusion with an approximation to the truth, whether these yields are increasing or diminishing. The same must be said of variation in crops. To form some idea on this subject there is but one way, namely, to collect harvest data extending over a lengthened period and from as many estates as possible. Calculations from the figures so obtained for each year will yield the material upon which a judgment may be based. Such a labour has been undertaken for rye, by Mr. Fortunatov, Professor of the Petrovsk Agricultural Academy, and by Mr. Grass. The diagram prepared by them embracing the period from 1840 to 1889 is appended to this work. It shows that the yield is on the whole increasing, while the changes in the harvests are at the same time diminishing. It must however be observed that this diagram does not include the famine year of 1891, which would of course have considerably disturbed the regularity of the curve drawn upon it. Moreover as the keeping of an account over such a long interval of time could be carried out only in the case of very well managed estates the diagram naturally gives a view of the change in the yield for the best cultivations only.

Notwithstanding the comparatively small yield per acre and the great variations in the harvests from year to year, Russia in the export of all breadstuffs has gained the foremost position among countries placing their grain surpluses upon the world's market, yielding to the United States only in respect to the export of wheat and maize. Even during the most disastrous years, when the under-yield of all sorts of grain compared with the average has exceeded the average export, Russia has nevertheless shipped very considerable quantities to the other countries of Europe.

The harvest of breadstuffs produced of late in the fifty governments of European Russia and in the United States are respectively shown in the following table.

	Russia. Bushels.	United States. Bushels.
Rye . . . . .	669,605,404	25,000,000
Wheat. . . . .	223,044,060	450,000,000
Oats. . . . .	530,524,036	650,000,000
Barley. . . . .	134,383,100	60,000,000
Buckwheat. . . . .	66,844,976	11,000,000
Maize. . . . .	17,807,844	1,700,000,000
All breadstuffs. . . . .	1,770,000,000	2,900,000,000

It thus appears that the production of all kinds of grain in the United States exceeds that in the fifty governments of European Russia by a little more than one-half. Adding the yield for the ten governments of Poland, for Finland, the Caucasus, Siberia and Turkestan the difference will of course be less considerable. Moreover from this comparison it appears that while in the United States the first place belongs to maize, yielding more than half the whole quantity of grain; in Russia the corresponding place is occupied by rye, produced however in comparatively less quantities than maize in America. On the whole, the United States produces and exports maize and wheat in greater quantities than Russia, which however stands first in the production and export of the remaining cereals shown in the table.

From diagram № 3 a clear idea may be obtained of the extent of the production of the chief breadstuffs considered according to the various districts and governments

of European Russia. The total length of the coloured strips on the diagram corresponds to the production of all cereals for each government; while the different colours and the length of the sections thus variously tinted indicate the quantity of each separate sort produced. The following colours have been chosen for this purpose: for rye, dark-blue; for winter wheat, lilac; for spring wheat, rose; for oats, yellow; and for other sorts, brown. The length of each strip from the base to the end of the lilac corresponds to the total yield of winter cereals, the remaining parts of the strips showing the total yield of the spring grains for each government. Leaving out of account the yellow parts of the strips, that is, the yield of oats, a comparison may be made according to governments of the total yield of the cereals used for human food. Oats are to be thus omitted because they are used in very limited quantities on the table.

On the whole the production of grain in the non-Chernoziom governments is insignificant compared with that in the Chernoziom with the sole exceptions of Perm and Viatka. For the most part it does not exceed local requirements. Least of all breadstuffs are produced in the governments of Archangel and of Astrakhan. Oats, and to a certain extent barley and peas, are grown in almost equal quantities in both the Chernoziom and non-Chernoziom districts. The production of rye in the Chernoziom governments exceeds that in the non-Chernoziom almost twofold, while wheat, buckwheat, millet, maize and spelt are grown in the non-Chernoziom governments is comparatively small quantities.

Of the total amount of grain, a part is of course used for seed and the remainder is divided between home consumption and foreign export. The following table exhibits at a glance, the average yield, seed and export in chetverts of the different breadstuffs for the past decade. From these data the amount of internal consumption has been deduced and the figures in the last two columns represent the consumption per capita of each cereal.

	Total yield.	Yield minus seed.	Export.	Consumption.			
				Total	Per capita.		
				C	h	e	t
Rye . . . . .	112,349,900	88,181,500	7,474,000	80,707,500			0·986
Wheat . . . . .	37,423,500	20,047,300	13,947,400	15,099,900			0·194
Oats . . . . .	89,014,100	62,387,300	9,291,600	53,095,700			0·649
Barley . . . . .	22,547,500	17,503,200	4,874,500	12,628,700			0·154
Buckwheat . . . . .	11,215,600	7,646,500	178,300	7,468,200			0·091
Millet . . . . .	8,003,400	7,426,800	31,000	7,395,800			0·090
Maize . . . . .	2,987,900	2,866,500	1,682,500	1,184,000			0·014
Spelt . . . . .	1,798,600	1,286,500	—	1,286,500			0·015
Peas . . . . .	2,855,700	2,164,900	365,000	1,799,900			0·026
Foodstuffs . . . . .	199,182,100	156,123,200	29,789,318	126,333,882			1·547
Total breadstuffs . . .	288,196,200	218,510,500	39,080,918	179,429,582			2·196
Potatoes . . . . .	47,010,400	36,164,000	—	36,164,000			0·442

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# MINIMAL AND MAXIMAL DEVIATIONS OF THE RYE crop from the average in per cents from 1881 to 1891 inclusive, per government.

Chapter VI. Breadstuffs, Diagram №1.

Lower than average.      Average.      Higher than average.

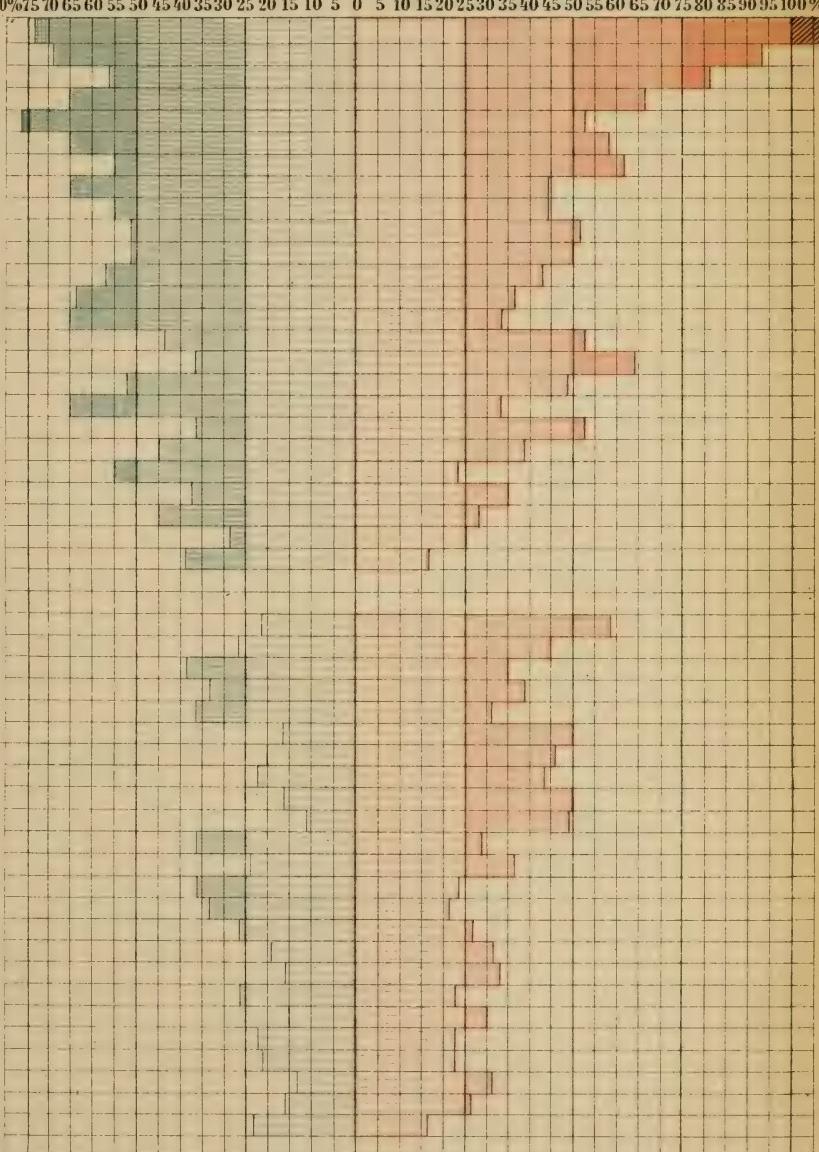
Names of Governments:

Chernoziom Governments.

1. Ekaterinoslav
2. Don Territory
3. Tauride
4. Kherson
5. Voronezh
6. Samara
7. Ufa
8. Simbirsk
9. Kiev
10. Kharkov
11. Saratov
12. Orenburg
13. Pensa
14. Kazan
15. Chernigov
16. Volyn
17. Poltava
18. Tambor
19. Bessarabia
20. Kursk
21. Riazan
22. Tula
23. Podolsk
24. Oriol
25. Niznni Novgorod

Non-Chernoziom  
Governments.

26. Minsk
27. Mogilev
28. Yaroslav
29. Courland
30. Tver
31. Kovno
32. Vitebsk
33. Pskov
34. Grodno
35. Vladimir
36. Pernu
37. Smolensk
38. St. Petersburg
39. Moscow
40. Kaluga
41. Viatka
42. Vologda
43. Livland
44. Kostroma
45. Novgorod
46. Olonetsk
47. Vilna
48. Estland
49. Archangel

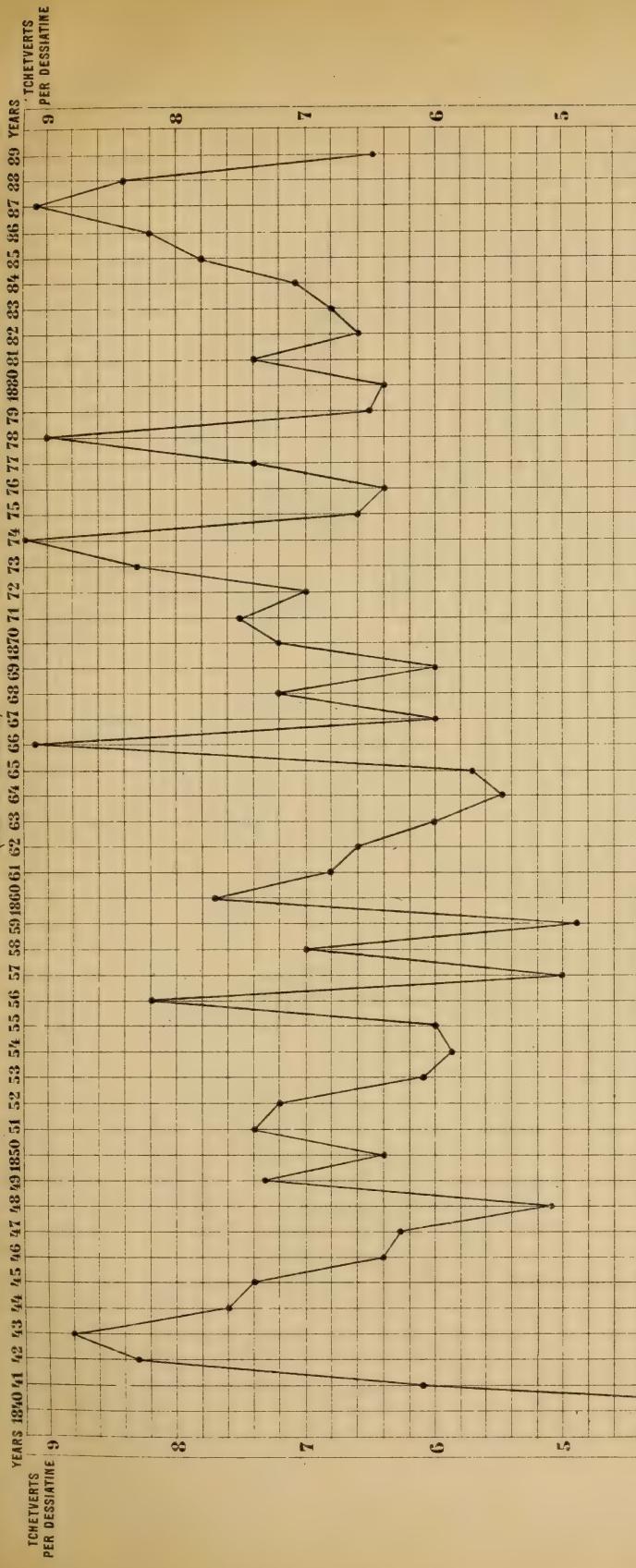




Ch VI Production of cereals. Diagram №2.

CHRONOLOGY OF RUSSIAN CROPS

(1840—1889)



CROPS OF CEREALS AS PER RECORDS

of private farms

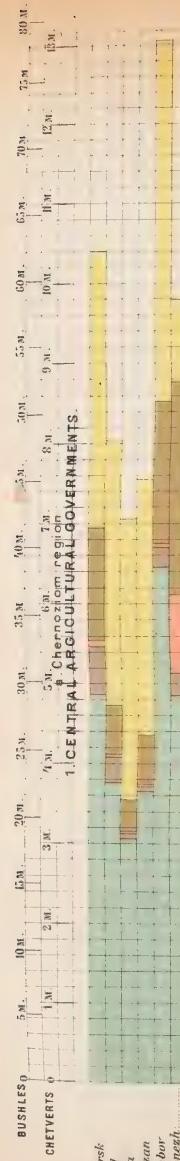
OF EUROPEAN RUSSIA

according to materials gathered by A.Fortunatov and L.I.Grass.

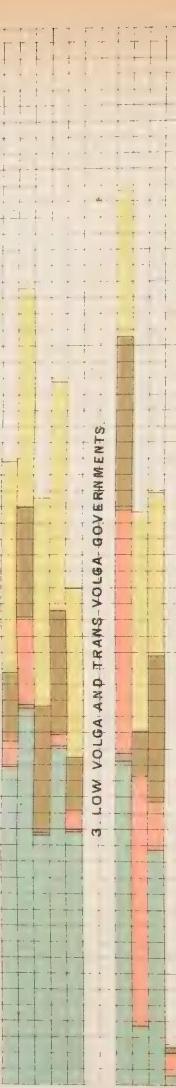
COMPOSED BY A.FORTUNATOV.

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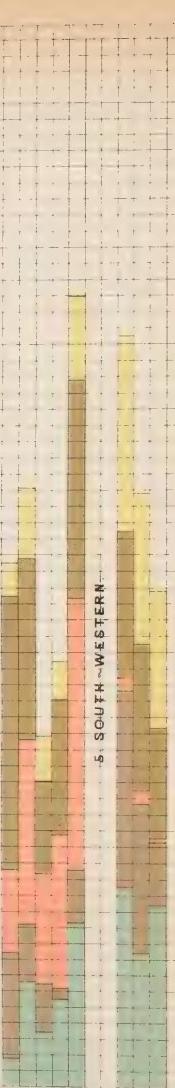




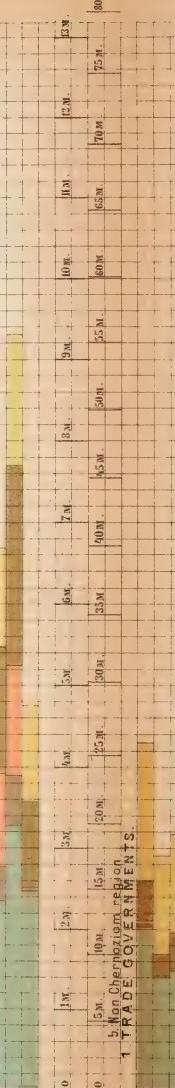
2. CENTRAL VOLGA AND PRE-VOLGA GOVERNMENTS.



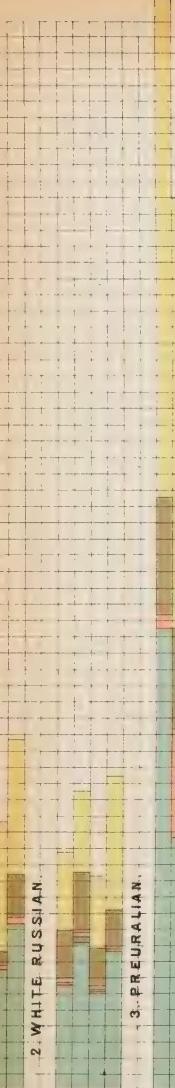
4. NEW RUSSIAN, SOUTHERN STEPPES.



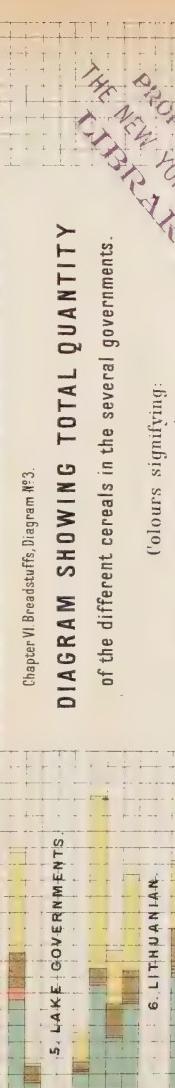
6. LITTLE RUSSIAN.



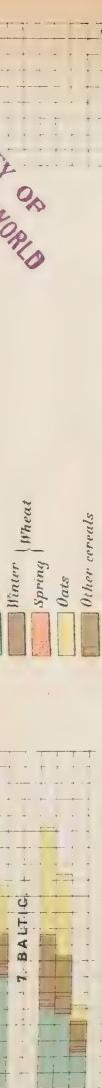
1.2. WHITE RUSSIAN.



3. PRE-URALIAN.



4. NORTHERN.



5. LAKE GOVERNMENTS.

CARTOGRAPHICAL WORKS OF A. SEMENOV, SPBZ.

D. Semenov, del.

## DIAGRAM SHOWING TOTAL QUANTITY

of the different cereals in the several governments.

(Colours signifying:



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Diagram № 4 may serve to make this table more clear. To the left of the central line are shown in various tints of blue the areas of different breadstuffs, dark for estates, and light for peasant farms. To the right of this line, shades of pink, crimson and lilac indicate the total yield: crimson, for the quantity of seed; pink, consumption; and lilac, export, for each kind of produce.

With the exception of winter wheat, peasants sow more grain of all sorts than landowners. The right half of the diagram shows at a glance the relative importance of the different kinds of breadstuffs as to production, consumption and export. Of most breadstuffs it may be said that they are sown mainly for home consumption, with the exception of wheat and maize which are exported in large quantities as seen from the table.

This circumstance can but influence the grain trade. It is evident that if a certain kind of grain could not be replaced by another the prices of wheat and maize in Russia would depend chiefly upon the foreign demand without affecting the market at home of the other cereals. Such however is not the case and for two reasons: first the prices of grain on the international market depend to a considerable extent upon the results of the harvest in Russia, whence very considerable quantities are exported: second, the advance in the price of one of the principal crops can but influence the price of such others as may be substituted therefor. This circumstance, taken in consideration with the fact that a certain quantity of grain remains over from one year to another in the form of reserves, and the variations in the home consumption, tends to explain the comparative uniformity of the annual export regardless of the fluctuations in the harvest.

In like manner may be explained the interdependence of home and foreign prices. Comparing the percentage of the export with the widest deviations in yield from the average for the last eleven years the following results are obtained:

Farm produce.	Per cent of the Average Yield.		
	Extreme variations.	Average export.	
Rye. . . . .	— 29·6	+ 11·1	6·6
Wheat . . . . .	— 34·4	+ 25·5	37·3
Oats. . . . .	— 27·5	+ 8·7	10·4
All breadstuffs. . . . .	— 26·4	+ 10·7	13·5

From this table one might think that in some years Russia had not enough grain for home consumption, and in others double the average export. As a matter of fact, however, the annual export is far from fluctuating to this extent even in the most disastrous years.

Diagram № 5 is instructive in this connexion. It draws a comparison between the surplus yield after the deduction of seed and the export of rye, wheat and oats, from 1883 to 1891. It hence appears that these free surpluses, as also the remainders after deducting export, varied from year to year much more considerably than the export itself. Thus for example, more wheat was sent abroad in 1891 than was harvested, not counting the amount necessary for sowing. This incredible statement may be explained

by the fact that the calendar year does not coincide with the farming year, and that during the first six or seven months of the calendar year no grain can be exported except that harvested the preceding years. The unexported surpluses accumulate in the country from year to year and thus make an average export of grain possible even during crop failures. At the same time the consumption itself decreases in a marked degree when there is a great under-yield, with a consequent increase in price as in 1880 and 1891.

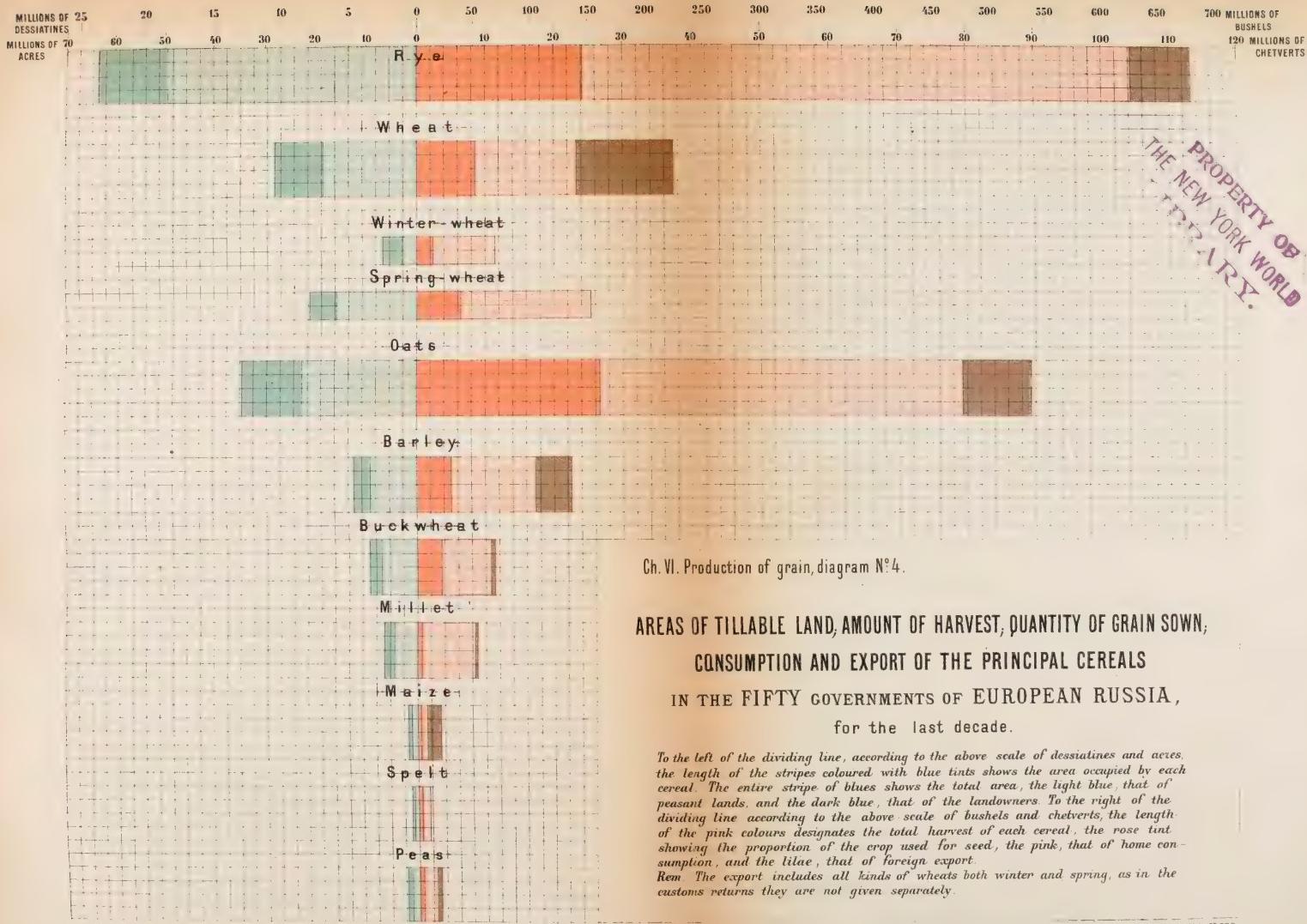
As calculated above for the fifty governments of European Russia the quantity of breadstuffs transported regardless of seed-grain may be estimated for the several regions. Such an estimate for a four-year period was made for rye and wheat in the Statistical Section of the Ministry of Ways and Communications, giving the following results for the consumption per head of the population for the different districts, which differ somewhat from that above reckoned for ten years, the figures being 11·97 pouds and 10·17 pouds respectively. This discrepancy partly depends upon the fact that the Ministry made its estimate on the basis of the nutritious qualities of both cereals.

G o v e r n m e n t s .	C o n s u m p t i o n p e r c a p i t a .					
	Wheat and rye.		R y e .			
	Pounds.	Pounds.	Pounds.	Pounds.	Per cent.	
Southern	Steppe . . . . .	12·62	458·6	3·83	138·3	30
	Non-steppe . . . . .	14·49	523·0	10·37	374·3	72
South-eastern . . . . .	16·92	610·8	11·51	415·5	67	
Central Chernoziom . . . . .	13·60	490·9	12·86	464·2	95	
South-western . . . . .	9·25	333·9	6·01	216·9	65	
Polish . . . . .	7·27	262·4	5·63	203·2	77	
North-eastern . . . . .	11·95	431·4	10·27	370·7	86	
Central Industrial . . . . .	12·86	464·2	11·13	401·8	87	
Northern . . . . .	7·96	287·3	6·96	251·2	87	
North-western . . . . .	13·05	471·1	10·35	373·6	80	

From these figures it appears that the consumption of bread is far from being the same in different localities; it is much more considerable in those districts producing the largest quantities of grain than in those growing less than needed for the local population.

On map, № 15, are shown the governments which on an average have a grain surplus that is sent to other governments and abroad, and also the governments in which more or less imported grain is consumed.

By the united action of all the above-indicated circumstances the fact is explained that the export of grain from Russia, with the exception of the period from November 1891 to June 1892 when it was prohibited by the Government, has never ceased, and whatever the fluctuations in the harvests itself, has shown only minor variations; at the same time, due to the increased area of cultivation and to improved communications resulting from the development of the railway system in the last thirty years, the export is continually increasing.



Ch. VI. Production of grain, diagram N°4.

AREAS OF TILLABLE LAND, AMOUNT OF HARVEST, QUANTITY OF GRAIN SOWN,  
CONSUMPTION AND EXPORT OF THE PRINCIPAL CEREALS  
IN THE FIFTY GOVERNMENTS OF EUROPEAN RUSSIA,  
for the last decade.

To the left of the dividing line, according to the above scale of dessiatines and acres the length of the stripes coloured with blue tints shows the area occupied by each cereal. The entire stripe of blues shows the total area, the light blue, that of peasant lands, and the dark blue, that of the landowners. To the right of the dividing line according to the above scale of bushels and chetverts, the length of the pink colours designates the total harvest of each cereal, the rose tint showing the proportion of the crop used for seed, the pink, that of home consumption, and the lilac, that of foreign export.

Rem. The export includes all kinds of wheats both winter and spring, as in the customs returns they are not given separately.

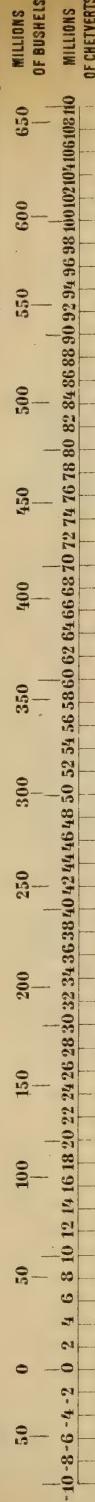


# HARVEST WITH DEDUCTION OF SEED

and export of the three principal crops for the last nine years.

The whole length of each stripe shows the harvest  
with deduction of seed; the dark-pinn shows the export.

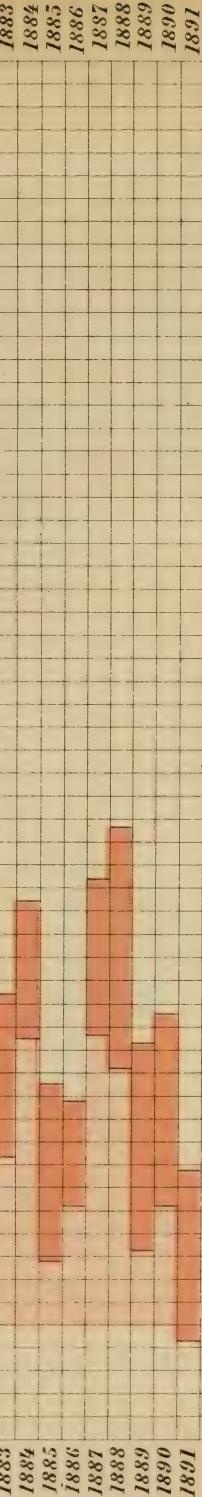
Chapter VI. Breadstuffs, Diagram № 5.



Rye.

Wheat.

Oats.



Cartographical works A. Jyne S.P.B.

Del. by D. S. Sennov



# LOCALITIES WITH AN EXCESS OR DEFICIENCY OF GRAIN CROPS.

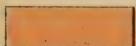
Chapter VI. Breadstuffs, Map №15.



Del. by D. Semenov.

Cartographical works A. Jlyne St. Pbg.

Localities with an average  
excess of grain crops



Localities where imported  
grain is consumed





Diagram, № 6, shows the average export for five-year periods from 1860 to 1890, the average export for the decade 1881 to 1890 and the annual export from 1881 to 1891. The lengths of the separate strips correspond to the totals of the export in chetverts or bushels, and the portions of the strips variously tinted are strictly proportional to the export of the different kinds of breadstuffs. The following is the scale of colours: rye, dark-blue; wheat, pink; barley, golden brown; oats, yellow; maize, red; bran, dark-brown; and for other breadstuffs, light brown.

In the representation of the export for periods of five years, maize and bran are not shown separately, but are included in the other breadstuffs. From this diagram it appears that the general and continual increase in the export of all kinds of foodstuffs beyond the limits of the Russian Empire is so considerable that no annual fluctuations can materially change it. Even in the exceptionally disastrous year of 1891, almost as much was exported as in 1883 when the maximum was reached for the whole five-year period of 1881 to 1885, and likewise more than the average of the whole five years in question, and even for the ten years, 1881 to 1890. As far as the separate kinds of grain are concerned, barley shows the largest increase of export, followed next by wheat and oats.

The export of rye both for individual years and for periods of five years, at least since 1875, shows only more or less important fluctuations but no tendency to increase. This is due to the extremely limited demand for rye abroad, in consequence of which excessively large surpluses of this grain, as was the case in 1887 and 1888, cannot be exported. In those years a severe lessening of prices ensued resulting in many private growers diminishing their cultivations of rye. It must be remembered that at that time the prices for all kinds of grain, alike in the international market and in Russia, were falling, that of rye being much more considerable than that of the remaining breadstuffs. This accumulation of rye reserves during a marked fall in prices continued up to 1890, and proved a blessing to the country as it lightened the task of providing supplies of this grain to the suffering districts during 1891 where the deficiency was very great.

In Russia, due to the variety of conditions presented by climate and soil, an extremely great variety of cereals, especially of wheats is met with.

All the kinds of wheat raised in Russia belong either to the common or soft varieties (*triticum sativum vulgare*), or to the hard wheats (*triticum durum*). Soft common wheats are subdivided into bearded and beardless, with long or short heads. The head is white or pale yellow, pink, yellow and reddish. Beardless wheats with long pale yellow or white heads are grown most of all in Poland. The most remarkable among them are the following: *kuiavka* — grain full, floury, of waxy hue, head thick, regular, almost square. The best *kuiavka* is raised in the Lublin government; winter and spring varieties exist. *Kostromka* is a winter wheat, grain large, oval, light yellow, almost white, vitreous, with thin hull, head long, somewhat compressed and contracted above. The productiveness of this wheat is greater than that of *kuiavka*, on an average about ten per cent, and it ripens early, whence it is less subject to disease than other varieties and supports well a dry climate and a changeable winter.

*Frankenstein*, also called New Zealand, Talovera, Danzig, Warsaw, Australian, has a reddish yellow grain, floury, with tender hull. The head is long, pyramidal, and of a yellow hue. It ripens early but rapidly degenerates. Of the beardless wheats

with long rose-coloured, yellow or reddish ear, the most common are: sandomirka, a winter variety; grain, white with yellow tinge, usually floury, head light red, narrowing towards the top, with thinly scattered beards; this sort easily degenerates, but bears frosts well; the best sandomirka is raised in the southern part of the government of Radom; yellow golokoloska or "naked spike" winter wheat, also called Odessa and Polish wheat; the grain is yellowish red, roundish, floury; the ear, pale yellow, narrowing towards the summit; this variety suffers greatly from droughts and is derived from sandomirka. Girka golokoloska is a spring wheat. The grain of this variety is orange or red in colour, half-hard, with very thin hull. Two sub-varieties of girka are distinguished, yellow and red; the head is reddish, narrowing very much towards the top and but thinly filled. The most valued girkas are the Alexandrovsk, Ekaterinoslav government, and Nikopol, Kherson government. Their flour is soft, the hull being very fine and producing a quick-rising bread.

Of the bearded wheats with long, whitish or pale yellow head the most common are the bielokoloska, "white ear" and samarka. Bielokoloska, also called bearded girka, has a red grain, small and vitreous in texture. The head is long and white with long white beards. It suffers little from rust or smut, and is cultivated chiefly in the south of Russia. Samarka, called also russak and Petersburg, is a spring wheat. Its grain is pale red, oblong, half-hard, like the grain of the Duluth and Milwaukee wheats; the ear is yellow, long, spread out wide and has long awns. The best samarka occurs in the governments of Orenburg, Samara and Saratov. Of the bearded wheats with long red or reddish head, banatka, shampanka, red usatka or winter red bearded, Taganrog, Krasnokoloska, "red ear", donka and saxonka are best known. Banatka, also called teiskaia, from the river Teiss, and shampanka, has a dark red grain, long, hard and with thin hull. The head is long, bearded, reddish. These wheats are of Hungarian origin and are widely spread in the governments of Kiev and Podolsk especially. They bear drought well, ripen early, are not easily broken down by wind-storms, but do not weather frosts, and drop their grain easily. Their flour has a bluish shade. Red usatka, or winter, red awned, Taganrog wheat has a grain with a reddish hull; it is half vitreous. The ear is long and reddish, provided with beards of the same colour. This variety is very productive, suffers from frost and drought less than others, and does not degenerate. It is very widely spread in the south of Russia. Saxonka, bearded, red, spring, or spring krasnokoloska. The berry is pale red with a thin hull; the ear, bearded and reddish. This is the best of all the Volga spring wheats. It is grown in the Samara government upon low-lying meadow lands.

The hard wheats (*triticum durum*) are all spring and bearded varieties. Among those most general are: white-awned spring or bieloturka (white Turkish) and kubanka; the former has a long, the latter a short head; red-bearded spring, arnautka, krasnoturka (red Turkish) and egipetka (Egyptian); the head is long, light red, with a blue bloom, square and dense; the beards are pale; the berry is hard, oblong, translucent, bright, and of a yellow amber colour; its section is smooth and horny; it contains sixteen per cent and more of nitrogenous compounds, but not more than seventy-five per cent of starch; this variety weathers the winter and drought well; black-bearded spring wheat; of these the chernokoloska, (black-ear), has an almost black head, while garnovka and chernouska, (black beard), have yellow ears and black beards.

Ch. VI. Production of cereals, Diagram №6.

## EXPORT OF THE PRINCIPAL CEREALS

in five-year periods from 1856 to 1890,

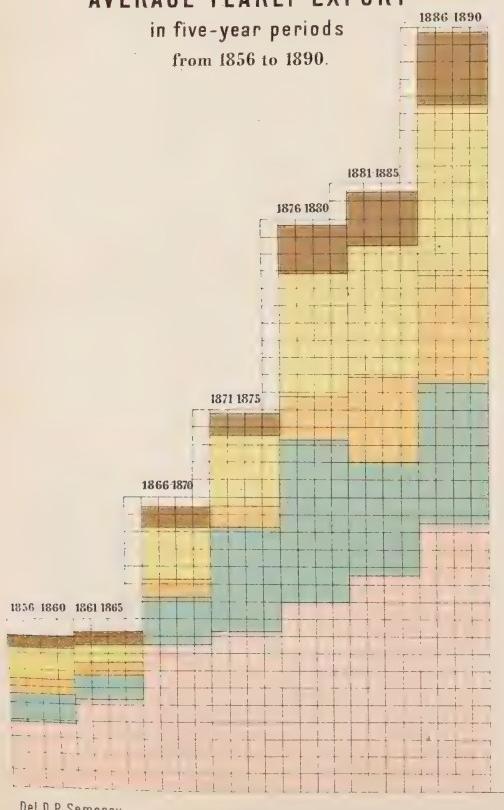
during separate years from 1881 to 1891

and on the average, during 10 years from 1881 to 1890.

## AVERAGE YEARLY EXPORT

in five-year periods

from 1856 to 1890.



Del. D.P. Semenov.

## YEARLY EXPORT during the 11 years

1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891

BUSHELS

250 M.

200 M.

150 M.

100 M.

50 M.

0 M.

## AVERAGE EXPORT during 10 years from 1881 to 1890

Total  
for each cereal

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The true spelt (*triticum spelta*) does not apparently occur in Russia. The variety bearing the name in Russia is really emmer (*triticum amyleum* Ser.); it is grown here and there in small quantities in the eastern part of European Russia. Two varieties are distinguished according to the colour of the head: white emmer, whose head has a pale yellow or straw colour, and red emmer, whose outer chaff-scales are, when ripe, of a reddish brown shade.

Russian wheat as an article of commerce may be divided into two classes according to colour, size, form of berry, softness or hardness, as follows:

I. Winter wheats.

1. White soft; sandomirka or soft white winter wheat;

2. White vitreous, kostromka or white, bright winter wheat;

3. White motley, a cross between white wheats 1 and 2, with a proportion of not less than ten per cent of yellowish and reddish grains. This species goes by the name of many-coloured white winter wheat. Wheats belonging to these varieties are grown in the Polish governments, as also in those of Volynia, Kiev, Podolsk and Kharkov. The inferior sorts go to the north of France, Denmark, Sweden and Hull; the best, to London and Marseilles.

4. Dark-red, dark red winter wheat, banata;

5. Light-red, light red winter wheat, Azima;

6. Yellow-red, yellow red winter wheat, Polish or Odessa.

The softer these wheats are, the brighter their appearance. The light-red is grown in the above-named governments, and also in Bessarabia, and in Voronezh and Oriol; it is exported to Holland, France and to the east of England. The dark red wheats are obtained from the governments of Tambov, Voronezh, Poltava, Kiev and Podolsk, and exported to Switzerland, the Upper Rhine, Western Germany and London.

7. Red motley; this is a cross between red-wheats, 4 and 5, with a proportion of not less than thirty per cent of yellow-sided and yellowish red grains. It is known as many-coloured red winter wheat. These wheats are derived from the Baltic and Polish, as also from the central governments. They are exported to Holland and Belgium.

II. Spring wheats.

1. Volga russak, also called Saxonka and Samarka; among the latter is Petersburg Samarka. The brighter and more tender-grained qualities are more highly esteemed.

2. Red girkas;

3. Yellow girkas; these are grown in the southern and south-eastern governments and are sent to the south of France and to London.

4. Motley russak, including Sura and Siberian, crosses between 1 and 2, with a large proportion of yellow-sided and yellow grains. They are also called red many-coloured spring wheat, and yellowish spring wheat. These varieties are cultivated in the governments of Nizhni-Novgorod, Simbirsk, Kazan, Perm, Viatka and Ufa, and are exported to Belgium, Holland and the north of France.

5. Hard spring wheats include bieloturka, arnautka, garnovka, eubanka, chernouska, chernokoloska; they contain a proportion of not more than thirty per cent of dark yellow grains; they are known as hard spring wheat or flint wheat, are grown in the south of Russia and exported principally to Italy, the south of France and to London.

Rye; of which two kinds are raised in Russia, biennial or so-called winter rye (*secale cereale hibernum*), and spring rye (*secale cereale aestivum*). Spring rye hardly ever bushes; its head, narrow and its berry small and poor in starch; it is accordingly not widely spread, occurring principally in the far north. Winter rye or zhito, on the other hand, is cultivated over the greater part of Russia and represents the principal grain.

Agriculturist and seedsmen reckon as many as twenty-six varieties of winter rye, but not all these kinds possess the quality of stability in a sufficient degree; they mostly degenerate rapidly or change their character with a change of climate and soil. Of the various kinds of winter rye the best known are the following: Probstei rye, so called from a place in Holstein. Its head is thick, full, pale yellow with short, dirty yellow beards; the berry is of a greenish yellow or light-brown colour, short, thick, with a tender hull, floury and heavy; the straw is grayish yellow, strong, does not fall easily under wind-storms and does not suffer from rust; the ivanovskaya has a shorter grain, which however is thick and floury; it bushes very much, so that it may be cut green in autumn without damage to the yield of grain; it weathers well a cold climate and snowy winters. Waza rye bushes well, and has an excellent berry, but shells very much in the field, if it be left standing long. Champagne is a rath-ripe sort, and it has a large berry, darker than Probstei. Yarensk rye has a smaller grain than the preceding but is very prolific and bears a severe climate well. Kustovka is so called from its habit of bushing, whence it requires less seed in sowing; it degenerates slowly and does not weather the cold. Vietvistaya or "branched" rye (*secale cereale hibernum compositum*) has in one earlet three to four flowers, giving the head, in consequence of the disposition of one kernel above another, a serrated appearance. Common rye; a variety with a long berry very much narrowed at the ends.

In the grain-trade two varieties are distinguished, namely kiln-dried rye, when the grain is dried in specially constructed buildings called oasts, and rye dried naturally in the sun, that is, by exposure in the open air. The former variety usually retains a smoky smell. Further, rye is distinguished according to the colour of the berry; when dark with black tips it is esteemed much inferior to that with a light greenish colour, because the latter gives white and more abundant flour. Lastly, the value of rye depends upon the nature of the grain, the heavier qualities commanding the higher price.

Oats; this grain is grown principally in the middle and northern Chernoziom zone, while in the Caucasus and in the extreme north it is almost unknown. The different varieties of oats cultivated in Russia are devoid of constant and definite characters. Experience has shown that the bristly hairs, the dark colour of the ear, and even the beards disappear with continued cultivation.

The principal criterion for different sorts is founded upon the form of the panicle; it may spread widely in all directions with the earlets attached almost horizontally to the stalk, the common oat, *a v e n a s a t i v a*; or the panicle may be compressed and inclined to one side, the one-sided oat *a v e n a o r i e n t a l i s*. The common oat, *a v e n a s a t i v a*, is also distinguished according to the length of the berry and the colour of the hull. The varieties are: 1. pale yellow, Canadian, Australian, if the grain is shining and short, and Scotch, Probstei, if the grain is long; 2. golden-yellow, Hungarian, Podolsk, potato-oat; 3. dark, Arabian dark blue or black.

To the one-sided oat belong the Australian, the white Hungarian and the black Tartar, also called Cossack or oriental. These kinds are distinguished by a tall growth,

a hard straw and rath-ripeness. The berry of the dark oat is always smaller, harder and heavier than that of the other varieties. The grain of the light sorts is always more tender and larger, whence their cultivation is more widely spread. Naked oats or Himalayan, *a v e n a n u d a*, are but little grown and very rapidly change to the common variety. Best known of all in Russia is the *s h a t i l o v* oat, also called Tula, French or *p e r e r o d*. The panicle of this variety is very extensively branched and bent to one side, its haulm is tall; the grain is large, full, thin-skinned and almost white. In the grain-trade oats are distinguished principally according to the colour of the kernel, as white oats, common or ordinary oats, black oats, clipped oats; further they are classed as kiln-dried and sun-dried, and attention is paid to the weight and cleanliness of the grain.

**B**arley; in Russia there are spring and winter barleys, the latter growing almost exclusively in the Caucasus; the different sorts, depending on the number of rows of grain in the ear, are called six-rowed, four-rowed and two-rowed. Six-rowed barley (*h o r d e u m h e x a s t i c h o n*) has a long or a short head, the latter being called Norwegian. All the earlets are fertile and the grain adheres to the inner hull. The quality of the six-rowed barley is lower than that of the two-rowed and four-rowed, and is mainly used in the preparation of groats, as feed for cattle, and in distilling. The four-rowed sort, *h o r d e u m v u l g a r e*, is grown more than the others. The winter kind bushes plentifully, is not easily broken down, and far exceeds the spring variety in respect to yield. It is rath-ripe, from which fact it is called in South Germany "rettema", *r e t t e d e n M a n n*, but in case of a snowless winter easily becomes frozen at a temperature of about  $-10^{\circ}$  to  $-15^{\circ}$  R. Four-rowed spring barley occurs both with the berry adhering to the hull and with a naked grain. Spring four-rowed naked barley has an irregular yellow ear with yellow beards and a light yellow kernel; it ripens in eighty to ninety days. Four-rowed barley with a naked berry is called Himalayan. Its grain is yellow with a violet cast, roundish and heavy; it affords a white and well-flavoured flour, but is not suitable for malting. It too easily shells in the field and is hence little grown.

Of the ordinary two-rowed barleys the most widely cultivated are the following:

1. The Scotch or March, chiefly grown in the western and Chernoziom governments; it bears frost well in the beginning of its growth; its head, which is long, droops while ripening but does not fall off.
2. Chevalier is a two-rowed bushing barley with a short flattened head remaining erect even after ripening. It grows faster than the first mentioned variety, tillers more, is less easily broken down, and suffers less from rust.
3. Two-rowed naked barley, called variously celestial, coffee, Himalayan, orkish (a Polish name). Its berry is heavy, usually dirty yellow or reddish in colour, as is also the external hull; it yields a flour of good quality and white, but is not suitable for brewing. This sort is little spread, its haulm being very brittle.

In the grain trade only two sorts of barley are distinguished, malting barley and feeding barley. The quality of the first is recognised principally by the colour of the grain, the brighter and whiter the better it is considered; the other criteria are the quantity of starch in the grain, the proportion of germinating grains, and the weight. If more than 45 per cent of flinty kernels are present, or more than 10 per cent incapable of germinating, such barley is considered unfit for brewing. The quality of feeding barley is determined by its weight, its colour, and the cleanliness of its grain.

Buckwheat is grown in European Russia, chiefly in two varieties, called respectively winged and wingless. The wingless form is cultivated almost exclusively in the south-west, and to a certain extent in the west, while the winged species occurs mainly in the east. In the remaining localities a transition form is grown.

Millet; three species with numerous varieties are grown in European Russia. Millet proper (*panicum miliaceum*) is known as *razviesistoe*, or "spreading", *poniklo*, *komovo*; *Panicum Italicum* occurs as *Italian millet*, *mohar*, *gom*; finally, *panicum (digitaria) sanguinale* is called *rosichka*.

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## CHAPTER VII.

## Grain-Trade.

Grain-export; various kinds of grain, and whence exported; prices, freight and insurance rates; other grain expenses; the importance of Russia in the international grain-trade.

**T**HE export of grain from Russia is every year subjected to considerable fluctuation due to the unequal demand in the several countries of import, which demand depends upon the harvest in the importing countries, as also upon the crop in those countries rivalling Russia in the international grain-trade. Moreover, the greater or less export of grain from Russia depends largely on the home-crop. The coincidence of a good crop in Russia and of a poor crop abroad, with an increase in prices, will cause a considerable increase of export; while a poor crop at home with a good abroad will similarly lessen the export. To what degree such extreme circumstances can act upon these fluctuations may be shown by comparing the exports in 1887 and 1888, when the crops were abundant, with those of 1890 and 1891, when the harvests were unsatisfactory. In 1891, although the export of cereals was interdicted part of the year, the average wheat export must be considered normal. In 1888 Russia exported 540 million pouds of grain, and in 1891, 390 million pouds, showing a difference of 150 million pouds, or nearly 33 per cent of the average export of the last five years.

A sufficiently clear idea of the fluctuation in the export, seen in individual years in comparison with the preceding, may be obtained by examining the export of a given year with the average export, for example, of the nearest five years, that is to say, with the two previous and the two succeeding years. Representing such an average by 100, the annual export from 1868 to 1891 has been found to be as follows:

In 1868—86 per cent.	In 1876—86 per cent.	In 1884—101 per cent.
» 1869—64 »	» 1877—94 »	» 1885—102 »
» 1870—125 »	» 1878—133 »	» 1886—72 »
» 1871—126 »	» 1879—126 »	» 1887—95 »
» 1872—78 »	» 1880—70 »	» 1888—131 »
» 1873—95 »	» 1881—73 »	» 1889—106 »
» 1874—118 »	» 1882—110 »	» 1890—95* »
» 1875—90 »	» 1883—114 »	» 1891—89* »

\* According to the average export from 1887 to 1891.

From these figures it may be seen that there were repeated fluctuations in the export of grain from Russia in the years indicated, occasionally in consecutive years of nearly 30 per cent above and also below the average. The following years showed a very poor export: 1869, with 64 per cent; 1880, 1881 and 1886, with 70, 72 and 73 per cent respectively, of the average; the years 1870, 1871, 1878, 1879 and 1888 were remarkable for their abundant export, their average ranging from 125 to 133 per cent. These data also show that the year 1888 cannot be considered exceptional as even a larger export of grain was seen much earlier; for instance, in 1871 and 1879 the five-year average export amounted to 26 per cent, and in 1878, to 33 per cent above the yearly average from 1876 to 1880. A striking fluctuation in export was seen in 1886 and 1888; in the first 261 million pouds were exported; whereas, in 1888 the export was 540 millions, or more than double the export of the preceding year.

But notwithstanding the considerable yearly fluctuations, the rapid growth of export is not to be doubted. The shipping of grain to other countries increases in importance with the march of railroads, with the growing production of cereals in Russia, and with the increasing demand of those countries obliged to import grain. The following comparison of averages for the five-year periods of the last twenty-five years gives a clear idea of the increasing export of all grain from Russia. In the table accidental fluctuations are not taken into consideration.

Five-year periods.	Yearly average export in millions of pouds.	Five-year periods.	Yearly average export in millions of pouds.
1866—70	127.8	1877—81	275·9
1867—71	147·2	1878—82	282·4
1868—72	149·2	1879—83	275·3
1869—73	163·9	1880—84	267·5
1870—74	191·4	1881—85	294·0
1871—75	193·2	1882—86	305·8
1872—76	196·2	1883—87	322·6
1873—77	218·6	1884—88	363·3
1874—78	256·2	1885—89	394·8
1875—79	279·3	1886—90	413·3
1876—80	279·8	1887—91	437·8

By taking into consideration the fact that from the beginning of the present century, namely from 1800 to 1813, the average annual export of grain from Russia amounted to fifteen million pouds, and that from 1844 to 1854, to forty-six millions, an idea of the development of the grain-export trade of Russia, from its beginning to the present day, may be formed. The steady development of the export of grain was retarded by a series of bad crops beginning with 1880; thereafter, it has steadily and rapidly increased. In the middle of the seventies, with the development of the southern railroads, the yearly average of export amounted to 200 million pouds; in the five years from 1882 to 1886 it was more than 300 million pouds; in the years from 1885 to 1890 it reached 400 millions, the year 1888 being especially remarkable by its export of more than 540 million pouds.

Representing the average export for the five years, from 1866 to 1870 by 100 per cent the following table will indicate the amount of increase since that time:

The average export from 1866–70 was 127·8 million pouds, or 100 per cent.

»	»	»	1871–75	»	193·2	»	»	151	»	»
»	»	»	1876–80	»	279·8	»	»	219	»	»
»	»	»	1881–85	»	294·0	»	»	230	»	»
»	»	»	1886–90	»	412·1	»	»	322	»	»

Thus the average export during the twenty-five years above tabulated shows an increase of more than three fold, notwithstanding the fact that there was about that time a considerable increase of export in the United States, as well as in other less important countries, for instance, the East Indies, Australia and South America. On the average, the yearly increase of export is 11 per cent, or more than 14 million pouds. The regularity in the increase of the average export during five-year periods is observed not only for all grains in general, but also for each grain separately, especially for rye, wheat, barley and oats, which hold the first place in Russian export.

Some irregularity of increase in the export of rye is noticed, as is natural. It has not the same international importance as other grain; it is demanded in great quantities only by very few countries, more especially Germany; therefore, the amount of rye exported from Russia will be largely dependent upon the rye crops in such countries. Another cause of this irregularity of export is due to the fact that rye is more and more in demand in Russia itself. The export of rye amounts only to 10 per cent of the amount grown in normal years, and therefore even a slightly bad harvest in Russia would be expected to diminish the rye export more seriously than the facts show. The following table will indicate the yearly average export for five-year periods from 1866 to 1890, and the per cent of increase of wheat, rye, oats and barley:

Y e a r s .	W h e a t .		R y e .		O a t s .		B a r l e y .	
	M i l l i o n p o u d s .	P e r c e n t .	M i l l i o n p o u d s .	P e r c e n t .	M i l l i o n p o u d s .	P e r c e n t .	M i l l i o n p o u d s .	P e r c e n t .
1866–70 . . . . .	76·7	100	19·8	100	14·8	100	7·2	100
1871–75 . . . . .	92·0	120	53·0	268	23·8	161	11·7	162
1876–80 . . . . .	110·4	144	82·9	419	42·6	288	20·5	278
1881–85 . . . . .	123·8	162	60·5	306	51·1	345	32·0	444
1886–90 . . . . .	160·7	210	82·0	414	61·1	413	61·2	850

From these figures it is to be seen that the export of wheat did not increase so rapidly as that of other grain. While during the twenty-five years enumerated above the total export of grain increased more than three fold, the increase in the export of wheat only doubled. The export of rye, oats and barley showed the greatest increase. In comparison to wheat such a considerable increase in the export of all other cereals can be explained only by the insignificant export of the latter during the first five years above mentioned. The absolute increase in the export of wheat for the last twenty-five years enumerated in the above table shows the greatest proportions: thus, the export of wheat increased 84 million pouds; rye, 62 million pouds; oats, 46 million pouds, and barley, 54 million pouds.

The average export of other breadstuffs, for the five-year periods from 1866 to 1890 is shown in the following table:

Years.	Maize.	Buck-wheat.	Millet.	Peas.	Beans.	Groats.	Millet meal.	Different kinds of flour.	Different brans.
	M i l l i o n s o f p o u d s .								
1866-70 . . . . .	3·2	0·3	0·2	0·9	0·02	0·3	0·02	4·2	0·2
1871-75 . . . . .	3·8	0·6	0·8	1·8	0·04	2·4	0·09	3·5	0·3
1876-80 . . . . .	9·7	0·9	0·2	2·1	0·40	4·7	0·32	1·5	1·1
1881-85 . . . . .	13·4	1·5	0·3	3·2	0·45	2·4	0·09	1·0	2·4
1886-90 . . . . .	18·5	2·0	0·3	4·0	0·90	1·4	0·01	1·1	9·1

It may be seen from the above table that the export of maize increased to a considerable degree during the time indicated. There was a less, but a very perceptible increase in the export of other crops, as buckwheat, millet and the siliquois produce. But it should be noticed that the export of groats and millet meal diminished, and that the export of flour, never very great, shows a considerable decrease. The falling off in the export of rye flour is especially noticeable, while the export of wheat flour showed little variation:

#### Export of wheat flour in pouds \*.

In 1877—1,379 thousand pouds.	In 1882—1,981 thousand pouds.	In 1887—2,350 thousand pouds.
» 1878—2,502	»	» 1883—1,839
» 1879—1,747	»	» 1884—2,013
» 1880—1,415	»	» 1885—3,492
» 1881—1,191	»	» 1886—2,487
		» 1888—2,695
		» 1889—2,162
		» 1890—1,617
		» 1891—1,809

Thus the export of ground grain from Russia is very small. The United States exports more than 50 per cent of her wheat in the form of flour, while Russia in recent years, exports hardly 1 per cent of hers. The cause for this is by no means the fault of the milling industry, as Russian wheat flour will compare favourably in quality and finish with the finest grades of American and European flour. The small export of wheat flour from Russia is rather explained by the fact that most of the countries that import flour, consume chiefly the lower grades, such as used in Russia itself; the better sorts, such as Russian millers would like to export, are hardly asked for, or if ordered, the price offered, is out of proportion to the higher quality of the flour. In the foregoing table is shown also the movement in the export of bran and other farinaceous residues. Such exports increased very greatly from 1886 to 1890, as explained by the fact that better prices are given abroad for such produce than at home; and by the fact that the export of such products to Germany, where Russian brans and coarse meals are principally shipped, is free of duty; as well as by the fact that the prices paid there are comparatively good, as such products in Germany are taxed.

\* Except the export to Finland, which amounted in late years to one million pouds per annum.

## Export of breadstuffs in thousands of pounds.

Years.	Wheat.	Hye.	Barley.	Oats.	Buckwheat.	Millet.	Maize.	Peas.	Beans.	Groats.	Millet meal.	Wheat.	F l o u r.		Other sorts.	Hye.	Barley.	TOTAL.	
													Millet.	Maize.	Peas.	Beans.	Groats.	Millet meal.	Wheat.
1866	69,569	14,083	5,970	14,825	176	595	587	401	4	64	7	3,141	4,953	28	2	49	11,9477	117	138,484
1867	86,124	30,317	4,410	11,255	7	11	948	281	2	407	2	2,970	2,970	520	2	143	109,669	143	109,669
1868	67,545	16,808	5,598	13,672	106	16	1,727	662	10	520	2	2,938	2,938	787	17	163	94,581	163	186,772
1869	63,668	10,391	5,015	9,304	11	83	1,639	787	17	495	100	7,184	7,184	2,347	41	410	140,661	410	186,772
1870	96,497	27,379	15,033	25,040	1,051	76	11,119	2,347	41	95	100	2,929	37	5,268	37	323	206,353	319	206,353
1871	115,264	35,107	11,540	28,457	466	45	5,778	1,130	9	605	9	652	652	4,161	49	2,203	2,203	360	183,220
1872	98,478	24,555	8,778	8,381	449	22	4,161	6,640	14	4,411	157	3,057	3,057	6,640	32	4,057	4,057	402	232,089
1873	69,572	66,503	9,286	20,628	826	32	6,640	1,734	152	2,455	219	2,963	2,963	3,634	152	1,549	1,549	264	195,895
1874	81,228	87,569	17,398	32,239	1,302	291	1,348	3,207	31	1,549	10	3,342	3,342	2,207	31	1,113	1,113	22	198,337
1875	95,286	51,393	11,730	29,402	269	23	1,762	1,762	721	1,415	1,415	1,379	1,379	1,762	18	783	783	221,228	
1876	92,365	72,643	11,784	31,381	542	37	3,768	1,077	29	3,459	18	4,774	4,774	81	81	1,191	1,191	552	260,433
1877	86,583	89,97	17,090	45,727	989	16	5,021	3,191	23	4,814	81	1,375	1,375	1,391	23	1,924	1,924	371,239	
1878	172,659	90,099	36,449	45,778	969	306	9,983	2,222	435	6,169	243	2,502	2,502	1,957	1,957	5,819	5,819	701	347,519
1879	139,219	108,189	23,053	46,771	754	538	15,584	1,957	905	5,819	555	1,747	1,747	3,634	152	1,415	1,415	1,733	198,337
1880	61,393	53,707	13,951	43,178	1,291	343	14,171	1,542	589	3,168	721	1,415	1,415	1,415	21	1,113	1,113	22	198,337
1881	82,224	38,325	20,683	39,053	721	51	13,588	1,295	539	2,275	44	1,191	1,191	768	6	749	749	201,812	
1882	128,230	50,848	27,192	53,361	628	502	16,468	4,627	775	3,131	155	1,981	1,981	1,981	126	1,924	1,924	293,086	
1883	140,665	69,144	39,862	60,182	1,899	268	11,086	8,827	426	2,483	118	1,339	1,339	1,339	50	1,682	1,682	365,985	
1884	113,710	68,960	33,929	60,382	1,837	263	17,136	3,233	295	2,697	85	1,013	1,013	1,013	10	712	712	335,985	
1885	154,058	75,060	38,437	38,938	2,460	191	8,670	2,961	974	29	3,492	1,378	1,378	1,378	26	3,724	3,724	330,600	
1886	86,656	65,023	41,258	34,651	2,682	127	19,695	1,787	571	14	2,457	14	1,787	14	4,337	4,337	260,802		
1887	130,619	77,553	58,541	61,016	2,609	201	29,761	4,188	960	1,338	5	2,350	2,350	1,338	5	6,451	6,451	376,985	
1888*	214,141	106,159	79,888	87,890	2,049	706	22,109	6,444	1,192	2,228	90	2,226	2,226	1,192	62	13,011	13,011	539,912	
1889	190,388	84,303	65,766	70,144	1,516	280	26,898	4,436	918	1,479	111	3,435	3,435	3,435	111	3,722	3,722	12,263	
1890	181,909	76,907	60,699	51,881	1,366	473	20,611	3,783	1,173	1,686	88	2,881	2,881	1,173	88	2,615	2,615	416,799	
1891	176,097	68,005	45,974	45,962	1,385	816	28,209	6,684	1,870	1,157	193	3,077	3,077	2,207	67	7,924	7,924	389,549	
1892	81,446	12,040	43,842	25,055	693	182	21,580	2,498	992	249	96	2,150	2,150	2,150	96	3,912	3,912	194,758	

\* From 1888 is included the shipments to the borders of the Black Sea, to the Caucasus and to Finland.

On page 115 is a table showing the yearly export of all cereals including flour and bran, beginning with 1866, and which served in the calculation of the above-mentioned data. This table indicates the fluctuations of the export of each year separately. During the last five years as said above, there was an especially large export in 1888.

In 1889, notwithstanding its insignificant crop, there was also a good export because of the stores left over from 1888. The crop of 1890 was also comparatively poor; still worse was that of 1891; but the export of those years was very considerable in 1891, 361 million pounds, notwithstanding the prohibition during the last months of the year. In 1892 the whole influence of bad harvests of the two preceding years was felt, when only 194,800,000 pounds were exported, approximately equal to that exported in the beginning of the seventies. Of course such a decrease is fully explained by the prohibition in force for nearly the whole of 1892. Nevertheless, there is reason to suppose that even if there had been no direct prohibition the total export of 1892 would have been but little better, because of an almost complete exhaustion of grain reserves before the appearance of the crop 1892 on the market. The demand at the home markets, even in the beginning of 1893, continued to be very considerable; therefore, the high prices did not correspond with those of the international market, which were depressed by the good crops of 1892 in southern Europe and America, and also by the still powerful influence of the magnificent harvest of 1891 in the United States.

The preceding table gives also an idea of the significance of the export trade of Russia of each kind of breadstuffs taken separately. Wheat, rye, barley, oats, maize, and latterly bran, show comparatively great importance; other varieties of grain are exported only in insignificant quantities, siliquous crops showing about 1 per cent of the total export, and others still less.

Tabulating in per cents the export of each kind of grain in comparison with the total export from 1866 to 1890, the following will be the result:

Yearly average export.	Wheat.	Rye.	Barley.	Oats.	Maize.	Bran.	Other grains.
	Per cent of total export.						
Five-year pe- riods.							
1866—70 . . .	60·0	15·5	5·6	11·6	2·5	0·2	4·6
1871—75 . . .	47·7	27·4	6·1	12·4	1·9	0·1	4·4
1876—80 . . .	39·4	29·7	7·2	15·3	3·5	0·4	4·5
1881—85 . . .	42·1	20·6	10·9	17·4	4·5	0·8	3·7
1886—90 . . .	39·0	19·9	14·9	14·8	5·8	2·2	3·4

As is seen above, wheat is the most important export, although not as great by far as twenty-five years ago, in consequence of the increasing export of the gray cereals.

In the last five years shown in the table the export of rye was only 50 per cent of that of wheat; while the export of barley, as also of oats, was about 38 per cent of that of wheat. As is shown in the table, the relative export of the different kinds of

grain is not yet established; wheat, maize and bran show an undoubted tendency towards an increase; rye seems already to have reached its relative maximum, while of wheat and oats as yet, no definite conclusion can be drawn. The export of each of the principal cereals, as shown above, has considerably increased.

It may be of interest to show the money value of the grain export, as compared to that of all other foodstuffs, and of merchandise in general. The following table will indicate the average annual value of the export of all foodstuffs during the five-year periods from 1871 to 1890, expressed in roubles, and in per cents:

Five-year periods.	Average annual value of export.					
	General merchandise.	Foodstuffs.	Cereals.		Grain relative to:	
			Paper rouble in millions.	Gold roubles in millions.	General merchandise.	Foodstuffs,
1871—75 . . . . .	356·4	183·2	175·8	148·0	49·3	96·0
1876—80 . . . . .	513·4	300·8	285·1	191·0	55·5	94·8
1881—85 . . . . .	545·7	323·2	300·6	190·2	55·1	93·0
1886—90 . . . . .	606·1	365·8	334·5	209·8	55·0	91·3

Of all foodstuffs grain, therefore, occupies the first place. In the first period of five years above-mentioned, grain shows 96 per cent of the export of all foodstuffs; while in the last five-year period it showed but 91·3 per cent. Nevertheless, the relative increase of the value of the export of foodstuffs other than cereal does not necessarily argue that their relative quantity is increasing; it may be due to the irregularity in the prices of grain and other provisions. In fact the prices of cereals have declined greatly of late, partly because of the general lowering of prices on the international market, and partly because of the increased export of the cheaper kinds of gray cereals from Russia. That the export value of grain has fallen since 1871, will be seen by examining the following table:

Annual five-year periods.	Grain export in millions of pounds.	Millions of roubles.		Per cent of export.	Value in per cents.		Value per poud.		Exchange Rate, Paper to Gold.
		Paper.	Gold.		Paper.	Gold.	Paper.	Gold.	
1871—75 . . . . .	193·2	175·8	148·0	100	100	100	88	74	119
1876—80 . . . . .	279·8	285·1	191·0	145	162	129	102	68	149
1881—85 . . . . .	294·0	300·6	190·2	152	171	128	102	65	158
1886—90 . . . . .	412·1	334·5	209·8	214	190	142	81	51	160

Thus, while the export of grain increased in quantity 214 per cent, its paper value increased only 190 per cent and its gold value 142 per cent. The decline of prices, as a simultaneous consequence of the two above-mentioned reasons, may be seen in the last column; the price of the poud of grain fell from 74 to 51 kopecks gold. The last column but one, shows the influence of the rate of exchange on the value of the export.

Thus, notwithstanding the decline in prices, 6 to 9 kopecks gold, during the two five-year periods from 1876 to 1885 respectively, the prices in paper roubles were 14 kopecks higher than during the five-year period from 1871 to 1875, because of a lower rate of exchange, when 149 to 158 paper kopecks were paid per gold rouble, instead of 119. In absolute figures the average value of the grain export during the five-year period from 1886 to 1890 exceeded 200 million roubles gold, and 330 million roubles paper.

The most valuable year to the export grain trade was 1888, when grain was shipped abroad to the value of 434 million roubles paper and 252 million roubles gold. Other remarkable years were 1878 and 1879, showing an export value of 230 million roubles gold, although the quantity exported was considerably less than in 1888, amounting only to 371 and 347 million pouds respectively, instead of 539 millions. On considering that the value of the grain export of recent years is 55 per cent of the total export, a good idea can be formed of the great value of the grain export trade to Russia.

The locus of shipment of Russian grain abroad may be geographically divided into four groups, namely: that of the White Sea, of the Baltic, of overland export, and that of the Black and Azov seas. The first of these groups centres at Archangel, which is of some importance as regards oats, but will never occupy a prominent place in the history of the export trade of Russia because of its unfavourable geographical position. The chief ports of the Baltic group are St. Petersburg, Reval, Riga and Libau, of which the first, united by water ways with the grain districts of Russia, was even before the development of railroads of very great importance. The other Baltic harbours developed their export business only after the appearance of railways leading thereto. To the group of the overland points of export belongs a series of towns situated on the borders of Russia and her neighbouring countries, Germany, Austro-Hungary and Roumania. Of these Virballen, Graevo and Mlava have the greatest importance, because the grain exported thence is not designed for Germany itself, but passes to Königsberg and Danzig whence, after being mixed with native grain, it is shipped to the countries bordering on the Baltic and North seas. The fourth group, namely the Black and Azov seas, is of all others the most important. The principal harbours in the Euxine group are Odessa, Nicolaev, Sebastopol, and lately Novorossisk. The most important harbours on the Azov are Rostov, Taganrog, Marioupol and Berdiansk.

The changes in the distribution of grain export in the groups named have been influenced principally by the development of railroads, and by the railway tariffs. To explain the influence of the development of railways on grain export, it is only necessary to note that since their construction the export of St. Petersburg has greatly decreased, while Libau has developed into a very important export harbour. On the other hand Novorossisk, since a branch of the Vladicavkaz railroad was united to it, began at once to increase very rapidly and perhaps will take the second place in the Euxine group in this particular. To explain the influence of the railroad tariff on the distribution of Russian export it is sufficient to refer to the recent railway war over freight rates between Odessa and Nicolaev, and to the importance of the policy of the south-western railroads, which directed the greatest part of the grain transport to Königsberg and Danzig, to the great injury of several of the southern ports. At the present time the above-mentioned circumstances have no importance in this direction, as the

railroads in European Russia are now completed, and the question of railway tariffs has passed into the hands of the Government, and therefore individual railroads are no longer able to prejudice grain transport in Russia. These tariffs began to be regulated by the Government in 1889, but the influence is hardly yet visible, for want of sufficient time, and because of the prohibition of grain export from Russia in the two following years, 1891 and 1892. Therefore the following deductions show only the significance which each port had on the export trade from 1885 to 1889, as compared with that of the five year period from 1867 to 1871, when the development of railways began to influence transportation in Russia.

The annual average export of the four principal kinds of grain from the different points may be seen below:

Frontiers.	W h e a t .		R y e .		B a r l e y .		O a t s .	
	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.
	M i l l i o n s o f p o u d s .							
White Sea . . .	—	—	0·4	—	—	—	2·4	1·6
Baltic. . . .	7·3	12·3	7·2	30·9	1·9	5·9	11·3	48·6
German . . . .	4·4	13·6	7·6	8·6	0·5	3·4	1·4	2·3
Austrian. . . .	1·4	2·1	0·8	2·8	0·2	1·0	0·2	0·9
Roumanian . . .	0·5	0·1	0·1	0·5	0·1	0·5	—	—
Black Sea * . . .	27·7	72·5	3·5	25·4	2·1	27·3	1·8	4·2
Azov . . . .	44·5	52·1	4·4	12·8	3·5	17·9	0·4	0·8
Total . . . .	85·8	152·7	24·0	81·0	8·3	56·0	17·5	58·4

The relation of the export of these four cereals from different ports to that of the entire European frontier will be seen in the following table:

Frontiers.	W h e a t .		R y e .		B a r l e y .		O a t s .	
	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.	1867 - 71.	1885 - 89.
	P e r c e n t a g e s .							
White Sea . . .	—	—	1·7	—	—	—	13·4	3·0
Baltic. . . .	8·5	8·1	29·7	38·1	23·0	10·6	64·2	83·1
German . . . .	5·1	8·9	31·8	11·1	6·0	6·1	8·2	3·9
Austrian. . . .	1·6	1·3	3·3	3·5	2·8	1·7	1·1	1·5
Roumanian . . .	0·6	0·1	0·3	0·1	0·8	0·9	—	—
Black Sea * . . .	32·3	47·4	14·8	31·4	25·5	48·7	10·5	7·2
Azov . . . .	51·9	34·2	18·4	15·8	41·9	32·0	2·6	1·3
Total. . . .	100	100	100	100	100	100	100	100

\* The export from the Black Sea and Caucasian frontiers, because of the short-time influence of Novorossisk, is not given.

The former of the two preceding tables shows the absolute importance of each point of export, the second the relative importance of each. As may be seen from these tables the borders of the Black and Azov seas were the principle harbours for wheat and barley export during the above-mentioned years. Latterly rye has been exported equally from the southern, Baltic and overland boarders, and oats principally from the Baltic ports.

In recent years, of all the southern ports the Black sea has been of the greatest importance; but formerly the Azov harbours held the first rank for all cereal export except oats. If it be taken into consideration that in the above-mentioned tables the export of Novorossisk was not included in the group of the Black sea harbours, the predominance of the Black sea ports would be still greater. In the overland group, a considerable quantity of grain is exported over the German frontier, through Graevo and Mlava, and thence through Königsberg and Danzig. Over the German frontier wheat export has somewhat increased and that of rye considerably decreased, to the benefit of the Baltic ports.

As to the cereals not mentioned in the tables, it should be noted that maize is exported from the southern frontier, principally from Odessa, and only in insignificant quantities through the overland customhouses, of which Volochisk occupies the first place. Bran is exported principally from the Baltic ports and from the Russo-German frontier. The export of other cereals from Russia is so insignificant, compared with that mentioned in the tables, that it is of no consequence to any of the export harbours.

The importance of each of the principal points of export and the changes which have taken place therein during the last sixteen years can be seen from the following comparison of the absolute and relative yearly average export of all cereals from 1870 to 1874, and from 1886 to 1890:

Average yearly export in pouds and in per cents.	The entire European frontier.	St. Petersburg and Cronstadt.	Reval.	Riga.	Libau.	Virballen Graevo Mlava.	Odessa.	Nicolaev.	Sebastopol.	Berdiansk.	Marioupol.	Taganrog.	Rostov.
1870 to 1874 in million pouds. . .	191·4	32·3	2·2	11·1	2·3	9·4	43·7	8·1	—	—	—	12·9	12·3
In per cents. . .	100	16·9	1·1	5·8	1·2	4·9	22·9	4·2	—	—	—	6·7	6·4
1886 to 1890 in million pouds. . .	412·1	41·3	11·0	16·9	32·8	22·3	92·7	32·8	19·9	12·2	8·0	14·4	40·2
In per cents. . .	100	10·0	2·7	4·1	7·9	5·4	22·5	7·9	4·8	3·0	1·9	2·5	9·7

Odessa is consequently the principal point of grain export, after which come St. Petersburg and Rostov. From 1888, with the construction of the Novorossisk railroad leading to the Black sea, the town of Novorossisk has acquired great importance. In 1890 the export of all cereals from Novorossisk attained 26,400,000 pouds; the same quantity was exported from St. Petersburg the same year.

From the above figures it may be seen that since 1874 the relative importance of St. Petersburg and also of Riga in grain export has decreased; while that of Reval and of Libau has increased; that of Odessa has remained unchanged, that of Taganrog has comparatively decreased, and that of Rostov has increased.

In absolute quantities the average export from each point has increased:

St. Petersburg . . . . .	to 9,000,000 pouds.	Odessa . . . . .	to 48,300,000 pouds.
Reval . . . . .	" 8,800,000 "	Nicolaev . . . . .	" 24,700,000 "
Riga . . . . .	" 5,800,000 "	Sebastopol . . . . .	" 19,900,000 "
Libau . . . . .	" 30,500,000 "	Taganrog . . . . .	" 1,500,000 "
Virballen, Graevo and		Rostov. . . . .	" 28,900,000 "
Mlava . . . . .	" 12,900,000 "		

If it be considered that since 1874 the grain export of Russia has increased from 191,400,000 pouds to 412,000,000, that is, an increase of 220,600,000 pouds, the increase of each point of export may be indicated in per cents as follows:

St. Petersburg . . . . .	4·1 per cent.	Odessa . . . . .	21·9 per cent.
Reval . . . . .	4·0 " "	Nicolaev . . . . .	11·2 " "
Riga . . . . .	2·6 " "	Sebastopol . . . . .	9·0 " "
Libau . . . . .	13·9 " "	Taganrog . . . . .	1·0 " "
Virballen, Graevo and Mlava.	5·8 " "	Rostov . . . . .	13·1 " "

The importance of each cereal for each point of export may be seen from the following comparison from 1886 to 1890:

	Wheat.	Rye.	Barley.	Oats.	Maize.	Other grains.
	In per cents of the principal cereals.					
St. Petersburg and Cronstadt . . . . .	17·0	31·0	0·1	47·0	—	5·0
Reval . . . . .	14·8	17·1	5·8	58·0	—	4·3
Riga . . . . .	6·6	29·6	17·7	42·5	—	3·6
Libau. . . . .	0·3	27·3	5·5	56·7	—	10·2
Virballen, Graevo and Mlava	39·7	13·3	11·2	7·5	1·6	26·7
Odessa . . . . .	49·7	13·6	17·1	1·6	14·9	3·1
Nicolaev. . . . .	46·5	27·3	24·1	1·9	—	0·2
Sebastopol. . . . .	46·5	27·7	17·0	6·3	—	2·8
Berdiansk. . . . .	84·5	2·4	12·8	0·2	—	0·1
Marioupol. . . . .	48·9	12·3	38·5	0·3	—	—
Taganrog . . . . .	62·1	13·0	24·7	—	—	0·2
Rostov . . . . .	57·5	24·9	15·7	0·7	1·1	0·1

As may be seen from the above table the principal cereal exported from the Baltic harbours is oats. St. Petersburg exports, besides oats, a considerable amount of rye; wheat is exported in smaller quantities, and there is scarcely any movement of barley. The export of Reval is nearly the same as that of St. Petersburg, with a more considerable shipment of oats and barley and a lesser of wheat and rye. From Riga and Libau wheat is exported in comparatively insignificant quantities; while the movement of rye and oats predominates; in Riga barley is an important export. These two harbours, together with St. Petersburg, export oil grains in large amounts. The Russo-Prussian frontier and the southern ports ship principally wheat, which attains 40 to 50 per cent, and in Rostov and Taganrog, 50 and 62 per cent of their general export; rye and barley is exported in lesser quantities, and oats play a very small part in the shipment of the southern ports.

The following table shows the quantity of the principal cereals, flour and bran shipped abroad from each of the export points from 1886 to 1892, and may also help to give a better idea of the character of the export trade from each of the principal ports.

## Export of cereals from principal points in thousands of pouds.

Points of export and years.	Total.	Wheat.	Rye.	Barley.	Oats.	Maize.	Peas	Buckwheat.	Hours.	Other food- stuffs.
St. Petersburg } 1886	50,638	15,602	19,667	8	14,782	—	13	219	301	46
	87	47,165	7,020	20,250	33	17,780	—	67	1,104	604
	88	49,515	2,763	16,546	48	26,235	—	159	2,070	451
	89	32,788	3,622	4,744	—	22,719	—	261	1,141	24
	90	26,215	6,145	2,742	—	15,459	—	51	1,438	27
	91	29,582	6,553	6,886	61	14,669	—	189	892	103
	92	3,679	40	7	—	3,534	—	14	1	93
	Revel . . . .	5,957	1,104	1,571	177	2,828	—	1	216	4
	87	12,935	1,213	3,467	252	7,255	—	19	57	2
	88	12,604	410	1,788	833	8,907	—	138	64	31
	89	12,085	1,404	1,028	1,017	8,170	—	203	97	—
	90	11,299	4,003	1,533	911	4,670	—	4	40	138
	91	8,049	2,366	1,447	601	3,390	—	23	3	1
	92	1,756	—	—	233	1,462	—	11	18	32
Riga . . . .	1886	8,097	186	2,660	2,770	2,227	—	129	26	1
	87	19,753	493	6,155	2,860	9,654	—	337	10	17
	88	24,724	1,019	7,427	3,235	12,101	—	429	—	52
	89	15,651	1,116	4,027	2,892	6,986	—	398	—	221
	90	16,240	2,772	4,765	3,242	5,000	—	223	8	1
	91	14,673	3,205	5,243	1,569	4,390	—	186	—	80
	92	6,576	462	120	1,221	4,622	14	74	—	4
	Libau . . . .	18,251	121	7,036	1,196	7,725	—	288	32	284
	87	28,510	9	8,201	1,804	16,185	—	812	47	177
Virballen } Graevo }	1886	9,456	3,006	1,311	671	1,299	47	451	—	28
	87	19,899	8,596	2,485	1,412	1,951	17	1,454	5	3,976
	88	39,173	16,324	6,323	5,285	2,911	55	2,174	—	3,6098
	89	24,997	9,743	3,083	3,648	779	1,003	873	—	9
	90	17,802	6,687	1,620	1,487	1,385	651	1,169	—	4,802
	91	23,024	8,427	5,003	1,497	1,774	698	1,983	—	10
	92	8,483	2,529	1,052	884	470	535	940	—	1,2072
	Odessa . . . .	62,291	21,084	9,215	12,504	1,323	14,851	166	33	2,123
	87	92,109	37,535	10,858	16,334	1,480	22,380	387	53	2,014
Mlava }	88	117,557	62,856	14,808	21,977	3,537	11,045	616	12	1,853
	89	105,675	59,350	17,087	13,785	645	12,406	435	18	1,657
	90	85,676	49,390	11,274	14,414	588	8,433	249	13	1,054
	91	82,360	47,016	5,879	12,555	1,200	13,689	391	12	1,202
	92	28,796	8,855	1,285	9,194	18	8,475	130	1	691
	Nikolaev . . . .	1886	14,563	4,219	4,635	5,162	484	—	—	—
	87	31,620	15,095	5,305	10,263	831	5	—	—	1
	88	47,441	21,815	11,735	12,288	1,419	108	—	—	76
	89	33,994	17,979	11,315	4,364	274	4	—	—	4

## Export of cereals from principal points in thousands of pouds.

Points of export and years.		Totals.	Wheat.	Rye.	Barley.	Oats.	Maize.	Peas.	Buckwheat.	Hours.	Other food- stuffs.
Nikolaev . .	1890	36,555	17,102	11,773	7,466	143	—	—	—	49	22
	91	30,370	18,249	5,898	5,526	652	—	—	—	29	14
	92	16,014	8,888	569	6,395	81	—	—	—	7	74
Sebastopol . .	1886	11,858	5,174	2,363	2,521	1,284	163	—	—	353	—
	87	15,872	5,285	3,399	3,736	2,608	110	—	—	360	74
	88	31,517	14,478	9,955	4,643	1,698	240	—	—	452	51
	89	26,965	13,932	7,522	4,777	295	—	—	—	459	—
	90	13,817	7,088	4,057	1,226	375	—	—	—	556	15
	91	12,773	8,300	1,971	1,273	564	—	—	—	608	57
	92	8,602	6,481	105	1,726	140	—	—	—	150	—
Bergiansk . .	1886	10,688	9,224	75	1,380	9	—	—	—	—	—
	87	10,957	8,922	30	1,907	98	—	—	—	—	—
	88	12,816	10,902	32	1,882	—	—	—	—	—	—
	89	13,523	11,782	661	1,080	—	—	—	—	—	—
	90	13,182	10,907	669	1,606	—	—	—	—	—	—
	91	11,477	10,492	309	676	—	—	—	—	—	—
	92	6,708	6,297	—	411	—	—	—	—	—	—
Marioupol . .	1886	5,063	2,457	5	2,601	—	—	—	—	—	—
	87	5,616	3,121	47	2,448	—	—	—	—	—	—
	88	11,456	5,433	1,359	4,601	63	—	—	—	—	—
	89	8,410	4,297	1,528	2,585	—	—	—	—	—	—
	90	9,522	4,304	1,999	3,179	40	—	—	—	—	—
	91	8,177	5,058	1,189	1,906	24	—	—	—	—	—
	92	6,236	2,520	162	3,554	—	—	—	—	—	—
Taganrog . .	1886	7,750	4,578	994	1,149	23	4	—	—	2	—
	87	12,172	8,179	748	3,223	7	6	—	—	7	2
	88	19,390	12,885	1,932	4,543	5	10	—	—	12	3
	89	15,361	9,472	2,371	3,501	2	4	1	—	8	2
	90	17,437	9,697	3,360	4,375	—	—	—	—	5	—
	91	15,359	9,881	2,069	3,390	14	—	—	—	5	—
	92	12,604	8,287	174	4,110	17	10	—	—	6	—
Rostov . .	1886	17,805	8,452	4,991	3,738	526	79	—	—	19	—
	87	32,549	19,193	6,558	5,789	285	669	—	—	39	14
	88	64,365	40,016	13,692	8,656	390	1,504	—	—	77	30
	89	39,703	21,999	9,204	8,417	47	—	—	—	36	—
	90	46,395	25,723	15,645	4,765	236	—	—	—	22	1
	91	37,011	20,775	12,105	4,018	92	2	—	—	18	1
	92	21,034	14,746	837	5,400	44	2	—	—	5	—
Novorossisk. .	1888	1,678	1,253	119	295	—	4	—	—	3	4
	89	15,407	10,250	1,731	2,989	445	37	—	—	—	5
	90	26,385	15,720	1,999	4,903	2,415	1,298	—	—	—	50
	91	20,637	13,831	2,023	2,135	614	1,956	—	—	—	78
	92	12,026	7,768	1,910	1,849	250	249	—	—	—	—
Poti. . . .	1886	7,260	2,259	3	619	—	4,378	—	—	1	—
	87	5,560	2,155	—	222	—	3,181	—	1	1	—

Points of export and years.	Totals.	Wheat.		Rye.		Barley.		Oats.		Maize.		Peas.		Buckwheat.		Hours.		Other food- stuffs.	
Poti . . . .	1888	3,705	117	—	—	15	—	—	—	3,572	—	—	—	—	—	—	1	1	
	89	4,003	—	—	—	—	—	—	—	4,001	—	—	—	—	—	—	1	1	
	90	3,007	—	—	—	—	—	—	—	3,006	—	—	—	—	—	—	1	1	
	91	3,567	—	—	—	45	—	—	—	3,521	—	—	—	—	—	—	—	—	
	92	4,223	—	—	—	—	—	—	—	4,223	—	—	—	—	—	—	—	—	
Batoum . . . .	1886	2,431	2,210	—	—	33	—	—	—	93	—	—	17	40	—	38	—	—	
	87	2,131	1,907	—	—	30	—	—	—	136	—	—	30	18	—	—	—	—	
	88	1,564	989	—	—	4	—	—	—	473	2	—	5	26	—	65	—	—	
	89	681	4	12	—	—	—	—	—	634	—	—	5	21	—	—	—	—	
	90	381	—	—	—	—	—	12	—	349	—	—	5	12	—	3	—	—	
	91	275	4	—	—	3	—	—	—	255	—	—	7	—	—	1	—	—	
	92	153	5	—	—	9	—	—	—	143	—	—	1	—	—	—	—	—	

The prices of breadstuffs in Russia, which supplies nearly all the countries of Europe with grain, are dependent on the state of the international market, especially since Russia has to compete with other grain-producing countries, and since trade, due to rapid communication, has attained great development. Therefore the prices, at exporting points of Russia, being dependent on foreign prices, are compelled to follow the market up and down. The fluctuations in the port prices necessarily influence the interior markets dependent on such ports, especially in all such parts of Russia as export grain. It must be observed, however, that there are markets where the prices of grain depend in a lesser degree upon those of foreign and port markets, as for example all localities not joined by railroads or by water with ports, such localities as provide grain for the great markets in Russia itself, as Moscow, St. Petersburg, Warsaw, as well as whole regions which do not grow sufficient grain for local consumption. The markets on the Volga, which send their grain to large mills situated on the river and the neighbouring railroads, are also not dependent to such an extent upon the prices at the exporting points, but nevertheless are influenced thereby. Thus the lowering of prices on the international markets in 1891 influenced also the prices in Russia.

The movement of the average prices of grain in Russia from 1881 to 1887 may be seen in the following table:

	Wheat.		Rye.		Oats.		Barley.	
	K o p e c k s		p e r		p o u d.		Paper. Gold.	
	Paper.	Gold.	Paper.	Gold.	Paper.	Gold.	Paper.	Gold.
1881 . . . .	127	84	109	72	74	49	86	57
1882 . . . .	112	77	86	59	63	44	72	50
1883 . . . .	107	66	82	51	63	39	72	45
1884 . . . .	94	59	78	49	66	42	71	45
1885 . . . .	89	56	69	44	69	44	73	46
1886 . . . .	90	55	62	38	62	38	64	39
1887 . . . .	88	49	55	31	49	27	55	31
Average . .	101	64	77	49	64	40	70	45

## VARIATIONS IN THE PRICE

of  
WHEAT

per poud  
in the following markets  
for the years 1889, 1890, 1891 and 1892  
in kopecks.

Paper

London, American winter №2.  
London, Russian winter.

London, Russian girkas.

St. Petersburg, Samarka.

Odessa, Bessarabian winter.  
Odessa, girkas ordinary.

Rostov-on-Don winter 1 sort.

Elets, local winter.

Saratov, Russian.

Gold

London, Russian winter.

New-York, winter №2.

Rate of exchange in paper kopecks  
per gold rouble.

Del. P. A. Shostak.

1889.

1890.

1891.

1892.



As is seen from the foregoing tables, there was a lowering of prices of all sorts of grain during the seven years from 1881 to 1887: of wheat, 31 per cent in paper money; of rye, 50 per cent; of oats, 34 per cent; of barley, 36 per cent; in gold money this decrease was still greater: of wheat, 49 per cent; rye, 57 per cent; oats, 45 per cent; barley, 46 per cent; so that due to the great decrease in the rate of exchange, which in 1887 reached 180 kopecks to the gold rouble, and 150 kopecks in 1881, the fall in the price did not fully influence the grain export.

In 1888, in consequence of a good harvest in that and in the preceding year, prices declined still more. In 1889 this decline on the European markets continued, and in consequence of a rapid increase in the rate of exchange, which began in February, with 194 kopecks to the gold rouble, and attained in December 1889, 148 kopecks paper to the gold rouble, it had a great influence on the prices in paper money, the currency of the country. In 1890 the prices differed very little from those of the preceding years, and a considerable advance was observed only in the beginning of 1891, in view of a very bad harvest.

The movement of the prices of wheat for the last six years may be seen from the following yearly average prices in Odessa for winter wheat in kopecks per poud:

Year.	Paper.	Gold.	Year.	Paper.	Gold.
1887. . . .	113·5	63·0	1890. . . .	90·1	65·5
1888. . . .	107·3	63·0	1891. . . .	108·5	74·4
1889. . . .	94·2	62·3	1892. . . .	101·1	63·5

A great decline, namely 13 kopecks, was observed in 1889, and an additional fall of four kopecks in 1890. From this comparison the influence of the rate of exchange on export trade may be seen; while abroad the prices in 1890 were 2·5 kopecks higher than in 1887, in Russia they fell to 23·4 kopecks paper, due to the increase in the rate of exchange, from 179·5 kopecks paper to the gold rouble to 137·7 kopecks. The opposite influence of the rate of exchange, can also be observed: abroad the prices advanced in 1890 to 1891, 9 kopecks gold, and in Russia in paper money to 18·5 kopecks; the rate of exchange in the same year declined from 137·7 kopecks paper to 145·7 kopecks to the gold rouble. The prices were at the highest in August 1891. In St. Petersburg, samarka wheat cost 140 kopecks, and in Odessa winter wheat, 125 kopecks per poud. In Moscow, as also in many of the interior markets, the price was 144 kopecks, rising in April, 1892, to 150 kopecks per poud. The price of rye was greater, for the most part, than that of wheat, especially in the markets of the interior, attaining in Nizhni 143 kopecks, and in Altire 150 kopecks per poud. The price of rye in 1892 was nearly three times as much as in 1890.

After the prohibition of the export of cereals was withdrawn prices in Russia, in consequence of home demands, continued to be so high that exportation was impossible, especially so as the prices abroad were considerably lowered, due to the fact of two good harvests in America and of good crops in Europe in 1892. Thus in normal years, to make grain export possible, the difference in prices in Odessa and London must be from 22 to 26 kopecks per poud; and in the fall of 1892 no such difference obtained. The yearly average of prices in Odessa for winter wheat are indicated below:

Year.	In Odessa.	In London.	Difference.
1888. . . .	107 paper kopecks.	133 paper kopecks.	26 paper kopecks.
1889. . . .	94 " " "	120 " " "	26 " " "
1890. . . .	90 " " "	112 " " "	22 " " "
1891. . . .	103 " " "	132 " " "	24 " " "
1892. . . .	95 " " "	110 " " "	15 " " "

The movement of the prices of grain in Russia in the different seasons may be seen from the following comparison between the monthly and yearly average prices founded on the data of several years:

Months.	Wheat.		Rye.		Oats.		Barley.	
	Higher	Lower	Higher	Lower	Higher	Lower	Higher	Lower
	Than the average yearly price in paper kopecks per poud.							
January. . . .	1·0	2·2	1·5	—	2·7	—	—	—
February . . . .	2·5	5·3	3·3	—	2·6	—	—	—
March . . . .	3·8	4·3	3·3	—	1·1	—	—	—
April . . . .	3·7	1·8	2·4	—	2·3	—	—	—
May . . . .	1·9	1·0	1·8	—	3·0	—	—	—
June . . . .	0·8	—	4·0	—	1·4	—	1·1	0·5
July . . . .	1·1	—	0	0	0·2	—	—	—
August . . . .	—	—	—	0·9	—	2·1	2·6	1·2
September . . . .	—	—	—	2·5	—	3·9	1·7	1·7
October . . . .	—	—	—	3·5	—	2·6	1·7	4·3
November . . . .	—	—	—	3·3	—	2·8	2·7	3·0
December . . . .	—	—	—	3·2	—	1·9	2·8	2·0
Yearly average	100·7		67·0		64·9		76·9	

The prices in Russia are consequently high during the first half of the year, and comparatively low in the second half, dependent upon the port supply. During the first half of the year the demand exceeds the supply, as then the stores in the ports and in the interior are exhausted. During the second half of the year, after the appearance of the new harvest, prices are much influenced by the numerous offers to sell, generally resulting in a considerable decline, especially in October. The general fluctuation from the yearly average price attains, in some seasons, for wheat 9 per cent and for other cereals 10 per cent; the decline of prices in autumn is somewhat greater than the advance in the spring.

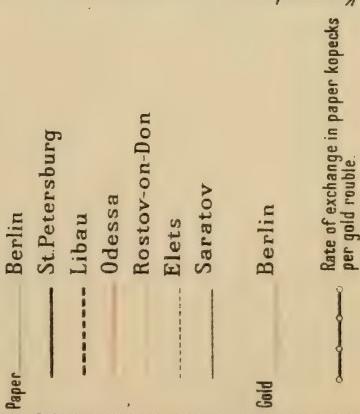
The relation of the prices at the interior markets to those of the ports depends principally on the cost of transport, as carriage is a principal item of expense on exported grain. Therefore grain always seeks the nearest port. Port prices are also fixed according to the expense of the transport of grain from them to the foreign ports. It would be possible to follow such fluctuations if simultaneous prices were obtained for each kind of grain; but as the prices are not defined in relation to the quality of grain, it would be impracticable to make such comparisons and the conclusions founded on such data would be misleading.

Passing this question, it should be remarked that some ports show a difference in prices of 10 kopecks and more per poud, according to the amount of confidence this or that kind of grain inspires on foreign markets. St-Petersberg, Reval, Riga, Berdiansk, Marioupol and Taganrog are famous for the good finish of their grain, which is therefore more prized abroad, and exporters pay the producer better prices, demanding however that the grain be of the highest quality.

## VARIATIONS IN THE PRICE

of  
RYE

per poud  
in the following markets  
for the years 1889, 1890, 1891 and 1892  
in kopecks.



Rate of exchange in paper kopecks  
per gold rouble.

Del P. A. Shostak.

1889.

1890.

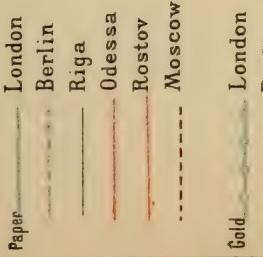
1891.

1892.



### VARIATIONS IN THE PRICE of BARLEY

per poud  
in the following markets  
for the years 1889, 1890, 1891 and 1892.<sup>110</sup>



Fluctuations in the value of  
the gold rouble in paper kopecks.<sup>111</sup>

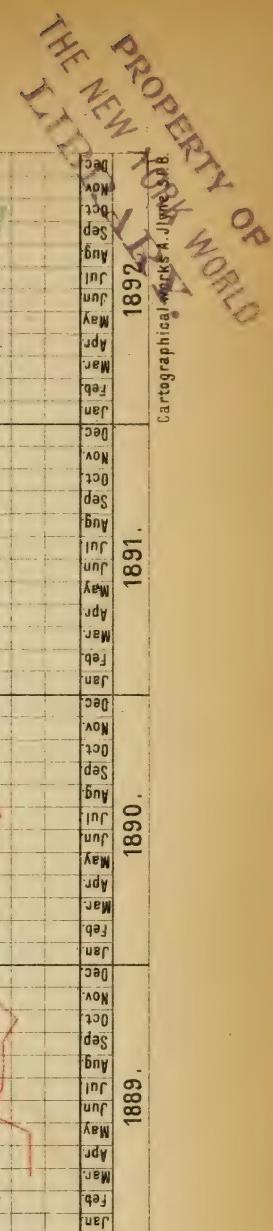
D. I. A. Shostak.

1889.

1890.

1891.

1892.



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WORLD  
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1892.



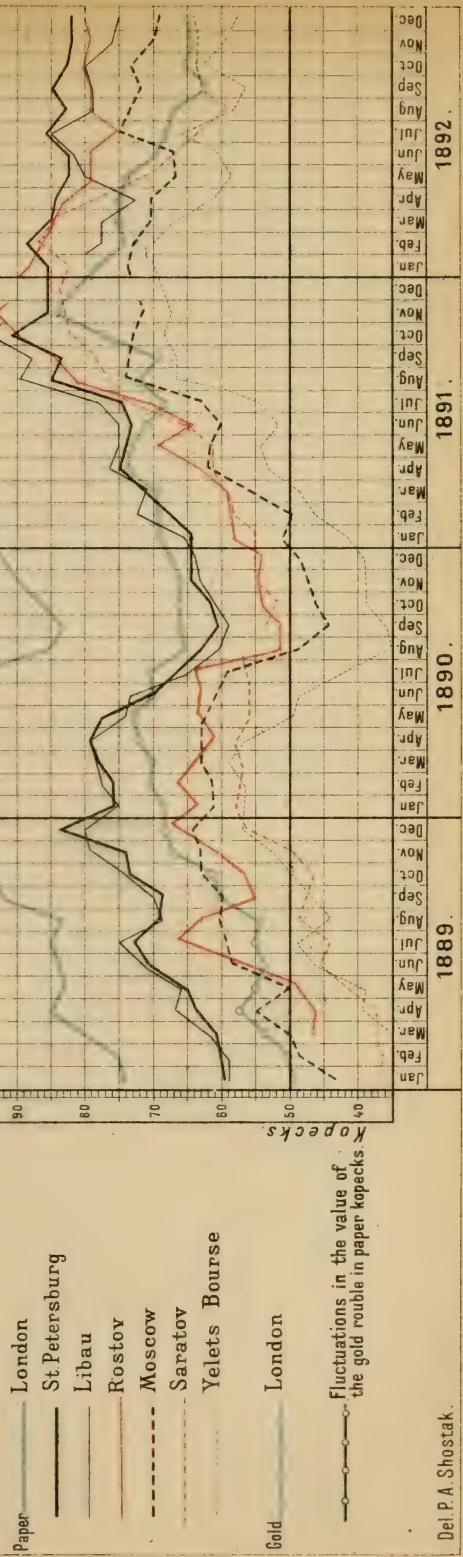
## VARIATIONS IN THE PRICE

of  
O A T S

per poud

in the following markets  
for the years 1889, 1890, 1891 and 1892

in kopecks.



Del P.A. Shastak.

Cartographical works A. Jlyne S.P.B.



To render more visible the fluctuation of prices of the principal foodstuffs during recent years in Russia, the following figures have been prepared, in which the simultaneous prices of some foreign markets are given. One may judge from these comparisons for 1890 of the prices for other crops in Russia in normal years:

	Paper kopecks per poud.			Wheat and rye brans.	
P e a s .	Fluctuation.	Average.		Fluctuation.	Average.
Moscow, average . . .	75—110	89	Moscov . . . . .	40—69	52
Rybinsk . . . . .	80—120	98	Tambov . . . . .	20—45	35
Saratov. . . . .	50—120	91	Elets. . . . .	28—53	40
Libau. . . . .	60—81	72	Voronezh. . . . .	18—42	27
Reval. . . . .	65—79	76	Odessa. . . . .	38—50	43
Riga . . . . .	40—75	66	Reval. . . . .	48—60	56
B u c k w h e a t .					
Elets. . . . .	63—80	71	Moscow. . . . .	106—128	117
Voronezh. . . . .	56—72	65	Eletz. . . . .	105—115	110
Koursk. . . . .	60—80	67	Saratov. . . . .	90—115	102
Libau. . . . .	68—79	72	Reval. . . . .	101—112	107
M i l l e t .					
Tambov. . . . .	50—85	63	Moscow. . . . .	95—150	128
Voronezh. . . . .	40—76	55	Eletz. . . . .	80—130	110
Koursk. . . . .	35—75	50	Voronezh. . . . .	85—145	112

The movement in 1890 of the price of maize in its principal export point, Odessa, is as follows:

	Paper kopecks per poud.			Millet grits.	
	Fluctuation.	Average.		Fluctuation.	Average.
January . . . . .	53—56	54·75	July . . . . .	47—51	49·25
February. . . . .	52·5—55	53·5	August . . . . .	48—53·5	49·75
March. . . . .	52·5—56	54	September . . . . .	51—54	52·5
April . . . . .	52—56	53·75	October . . . . .	51—58	52·0
May. . . . .	50—54	51·5	November . . . . .	57—65	60·25
June. . . . .	48—51	49·0	December . . . . .	56—66	61·5

In the entire year, 1890, fluctuation 47 to 66; average, 53 kopecks.

The amount of sea freight for grain export depends principally upon the state of the international freight rates, the geographical position of the port of destination and of the port of export, and upon the cereal exported. As to the first of these conditions influencing the freight rates it may be observed that for the last two or three years the cost of transport has considerably lessened principally in consequence of the increasing number of ships in England, and the insufficiency of work for them. The highest freight rates were in 1888; in the southern ports transport to London cost 14 to 18 kopecks per poud, and in the northern, from 8 to 9 kopecks; at the present time they are much lower, from 3 to 4 kopecks paper money, as may be seen from the table on page 129.

As to the influence which the geographical position of foreign ports has upon the amount of freight, they may be divided into three principal groups, according to the principal directions of export: 1. freights to England and to the so-called continent,

that is, the borders between Hamburg and Havre; 2. freights on grain exported from the Baltic ports to the northern borders of Germany, principally to Stettin; 3. freights from the Black and Azov sea ports to those of the Mediteranean, principally to Italy and France.

Freight rates from the Baltic ports to England and the Continent differ very little; to the Continent the rates are sometimes even lower than to England. The difference between the freights from the Baltic ports to Stettin and those of the preceding group is about 1·5 kopecks per poud. Freights of the Black and Azov sea ports to Marcel and to England show a difference of 1 to 2 kopecks per poud.

With reference to port freights the highest are those of the Azov harbours, being on the average from 4 to 5 kopecks per poud higher than those of the Black Sea, and from 7 to 9 kopecks higher than those of the Baltic. The freights from Odessa, Sebastopol and Novorossisk can be considered equal; freights from these ports to the eastern borders of England are higher than those from the Baltic ports, from 3 to 4 kopecks per poud; the cheapest freights are those from the Baltic ports, with Libau at the head.

As to the different cereals exported freights are relatively lowest for wheat, rye and maize and highest for oats, while the rates of barley are intermediate between the two extremes. In per cent it may be thus expressed:

	Wheat and maize.	Rye.	Barley.	Oats.
Baltic ports . . . . .	100 per cent.	95·5 per cent.	105·5 per cent.	120 per cent.
Black and Azov sea ports.	100 » »	101 » »	109 » »	140 » »

These figures are obtained since 1890 when the ton of weight was introduced as the unity of freight calculations. Previous to that time the unity was the gross ton and the per cents were as follows: wheat 100 per cent, rye 103 per cent, barley 106 per cent, oats 129 per cent.

In addition to the above-mentioned causes that influence the cost of freight there are many other circumstances chiefly local, as for example, the greater or less amount of grain exported during a given time; whether the vessel carrying the cargo can enter port without ballast; whether the ships can be loaded with or without the aid of lighters, and finally whether the port be more or less protected from the winds.

In insurance rates there are also great differences depending principally upon the points of export, upon the season, and in a lesser degree upon the duration of the sea voyage. In the Azov ports insurance is the dearest, and in Libau the cheapest. As to the influence of seasons the cost of insurance is the dearest in the Azov ports and in St. Petersburg during the autumn when the ships are in danger of being crushed by the ice.

The following table contains the yearly average freights and insurance rates for wheat and rye from 1885 to 1891 inclusive. From the above freight rates it is not difficult to calculate the cost of transport of other cereals. The freight rates are given from the principal Russian ports to the principal points of destination, that is, for London, consequently for the whole of the eastern border of England, and for the continent, Marcel and Stettin. In view of the great importance that the Berlin market has for the Baltic ports, the freights on rye from Libau, through Stettin and by the canal of Stettin, to Berlin are also given.

## Cost of freight and insurance of one poud wheat to London in paper kopecks.

From.	Years.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
St. Petersburg.								
Freight . . . . .		5·01	4·63	5·51	7·16	5·69	3·59	3·91
Insurance . . . . .		1·31	1·14	1·18	1·12	0·83	0·53	0·70
	Total . . . . .	6·32	5·77	6·69	8·28	6·52	4·12	4·61
Libau.								
Freight . . . . .		5·49	5·01	6·45	7·23	5·47	4·36	4·58
Insurance . . . . .		0·69	0·61	0·69	0·64	0·41	0·44	0·36
	Total . . . . .	6·18	5·62	7·14	7·87	5·88	4·80	4·94
Odessa.								
Freight . . . . .		8·89	7·33	10·83	13·00	10·40	7·80	8·71
Insurance . . . . .		0·99	1·14	0·99	0·97	0·88	0·81	0·95
	Total . . . . .	9·88	8·47	11·82	13·97	11·28	8·61	9·66
Rostov on Don and Taganrog.								
Freight . . . . .		11·91	10·38	13·55	16·93	13·89	11·22	11·46
Insurance . . . . .		1·10	1·22	1·31	1·02	1·17	1·12	1·09
	Total . . . . .	13·01	11·60	14·86	17·95	15·06	12·34	12·55
Novorossisk.								
Freight . . . . .		—	—	—	—	12·09	8·80	9·41
Insurance . . . . .		—	—	—	—	1·14	1·01	0·96
	Total . . . . .	—	—	—	—	13·23	9·81	10·37

## Cost of freight and insurance of one poud wheat to Marcel in paper kopecks.

Odessa.								
Freight . . . . .		7·88	6·97	9·49	10·19	8·19	6·24	7·45
Insurance . . . . .		0·72	0·59	0·60	0·60	0·56	0·52	0·61
	Total . . . . .	8·60	7·56	10·09	10·79	8·75	6·76	8·06
Rostov on Don and Taganrog.								
Freight . . . . .		12·65	10·94	13·66	14·16	11·73	8·86	—
Insurance . . . . .		1·01	0·87	0·85	0·61	0·87	0·68	—
	Total . . . . .	13·66	11·81	14·51	14·77	12·60	9·54	—

## Cost of freight and insurance of one poud rye to Stettin in paper kopecks.

St. Petersburg.								
Freight . . . . .		4·61	4·21	5·00	5·86	4·29	3·51	—
Insurance . . . . .		0·40	0·34	0·32	0·35	0·30	0·30	—
	Total . . . . .	5·01	4·55	5·32	6·21	4·59	3·81	—
Libau.								
Freight . . . . .		4·14	3·76	4·56	5·35	4·27	2·98	3·31
Insurance . . . . .		0·45	0·38	0·28	0·26	0·24	0·24	0·18
	Total . . . . .	4·59	4·14	4·84	5·61	4·51	3·22	3·49

## Cost of freight and insurance of one poud rye to Berlin in paper kopecks.

From Libau . . . . .		7·87	7·92	9·00	9·45	7·63	5·79	5·95
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The costs of shipment are partly paid by the producer of the grain, as for instance, the expenses of carrying the grain to the ports and of delivering it on board to the purchaser, and partly by the purchaser, and as a last resort by the exporter. Of the expenses paid by the producer only those can be defined which he pays at the ports; the shipping expenses incurred before the grain is loaded into cars at the nearest station, or directly into ships, are principally those of cartage and of middlemen. The expenses attendant upon the selling of grain on the spot are subject to such changes depending upon the locality and the time of the year and the practice of middlemen that they cannot be defined. In general, it may be said of these expenses in Russia that, owing to the insufficient number of branch railway lines and to the lack of good roads in the grain-producing districts, the carrying of the grain to the stations is very expensive to the owners, sometimes costing five kopecks and even more per poud.

The port expenses are more uniform, especially if no account be taken of exceptional sundries depending, for example, upon the bad state of the grain itself and therefore requiring careful attention before it is loaded, or upon an accumulation in the harbours, resulting in increased wages to workmen.

Such export dues as are termed general expense, because they fall without exception upon all grain shipped abroad, were thoroughly examined in 1889, and the results of this examination are given below in totals. Since then no measures have been taken to lessen or to regulate such expenses except perhaps the recent construction of elevators in some of the harbours, which however have too little capacity to influence materially the cost of handling grain in ports of shipment. These totals indicate the following expenses: the transfer of grain from the railway stations to the store houses; the unloading and delivery to the storehouses, including the expenses of weighing; storage, loading, re-weighing, cartage to ship and ship-loading, the paving of the hold with mats, and finally the town and port dues. Of such expenses part is paid by the seller and part by the purchaser, dependent upon the terms of sale, whether the grain is sold deliverable at the granaries of the producers, at the railway stations, or free on board the ship. For each port such expenses are tabulated as follows in kopecks per poud:

Ports.	Sellers.	Buyers.	Total.	Ports.	Sellers.	Buyers.	Total.
St. Petersburg . . . . .	1½	1½	3	Sebastopol . . . . .	—	3	3
Reval . . . . .	—	3	3	Marioupol . . . . .	—	5¼	5¼
Riga . . . . .	1	2	3	Taganrog . . . . .	1	5	6
Libau . . . . .	1	2	3	Rostov . . . . .	1	5	6
Odessa . . . . .	2	2	4	Novorossisk . . . . .	—	3	3
Nikolaev . . . . .	1½	1½	3				

In most ports the total expense is three kopecks per poud; in Odessa it is one kopeck dearer, principally for the taking care of grain in the granaries; in the Azov ports, three kopecks dearer, because the grain must be transported to the ship by lighters.

Besides the above-mentioned expenses falling on grain, there is the cost of commission, 1 per cent, and of brokerage, both of which generally fall partly on the seller and partly on the purchaser. To the data in the table it is necessary therefore to add the port expenses in the following proportions: for wheat, from 1·5 to 2 kopecks; and for rye and oats, from 0·50 to 0·75 kopecks per poud.

The expenses in port are consequently for wheat:

Baltic ports . . . . .	from 4 to 5 kopecks per poud
Black Sea ports, Odessa . . .	6 " "
Azov " " . . . . .	» 7 to 8 " "

The expenses falling on grain from the moment it passes into the hands of the exporter are smaller relatively than the expenses paid by the seller and included in the purchase price. These expenses which, added to exchange rates, represent the price of grain on board ship, are tabulated as follows:

	Wheat.	Rye and Oats.
In St. Petersburg, kopecks per poud . . . . .	1·87	1·69
» Reval " " " . . . . .	3·37	3·19
» Riga " " " . . . . .	2·37	2·19
» Libau " " " . . . . .	2·37	2·19
» Odessa " " " . . . . .	2·37	2·19
» Nicolaev " " " . . . . .	1·87	1·69
» Sebastopol " " " . . . . .	3·37	3·19
» Marioupol " " " . . . . .	5·62	5·44
» Taganrog " " " . . . . .	5·37	5·19
» Rostov " " " . . . . .	5·37	5·19
» Novorossisk " " " . . . . .	3·37	3·19

The great differences in the outlays at different ports, shown in the above table, may be explained by the different significance of port prices. In St. Petersburg, for instance, the port price includes the cost of lighters; in the Baltic ports and in Novorossisk it includes the receipt of grain at the station; in other ports, at the granaries.

As is seen from the above, port expenses are until now very considerable; but undoubtedly with the development of elevators to facilitate the storing of grain at the different ports, and with proper drying, cleaning, weighing, loading and unloading devices, these burdens upon Russian export of grain will in due course become perceptibly lighter. Such improvements will probably be followed by the introduction on all railroads of a regulated system of commission and brokerage dues, thus again lifting another heavy burden from grain export.

Besides these dues at the Russian ports, grain is also taxed at the foreign ports to a greater or less degree. A considerable part of these expenses form commission and brokerage amounting, for instance, in London for Russian southern ports, to 2·5 per cent, and for the northern, 1·25 per cent.

Of these expenses, freight, insurance, and dues at the Russian and foreign harbours, form the difference which is noticed between exchange prices of grain in the Russian and foreign ports, attaining in Odessa on export to London, 25 kopecks, and to Marcel, 17 kopecks.

The importance which the consuming countries of Europe have to the Russian grain trade may be seen, together with the importance of Russia itself in supplying such countries with grain, in the following tables. In order to arrive at correct results it is necessary to have recourse to foreign data, as Russian statistics showing in detail the amount of home export, cannot give an accurate account of its destination after it has passed the Russian frontiers.

The remarks in the Russian custom reports, based on the declarations of shippers with reference to points of destination, serve only as a more or less exact indication of the importance of the several countries to Russia in the grain export trade, but do not indicate the consumption of Russian grain. In this particular the first place belongs to Great Britain which serves to a considerable degree as a mediator in the distribution of Russian grain to other lands. For instance, the statistics of Russia, and of other countries with reference to rye, show that Russia exported to Great Britain on an average about 16,000,000 pouds; whereas the latter country, according to its own figures, consumes only 500,000 pouds of Russian rye. Undoubtedly therefore the surplus, amounting to 15,500,000 pouds, is transhipped to other points. In fact in comparing the statistics of Russia with those of other countries it will be seen that Russia should be accredited in Germany, Holland, Norway, and in other European countries, with about 15,500,000 pouds of rye more than the figures show; a similar discrepancy may be found in the data of all other cereals exported from Russia.

The table below, based exclusively on foreign statistics intended to indicate the consumption of Russian grain, shows that the principal countries import the principal cereals as follows:

#### Importation of Grain from Russia.

C o u n t r i e s .	W h e a t .		R y e .		O a t s .		B a r l e y .	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
	M i l l i o n s o f p o u d s .							
Great Britain. . . . .	66·1	60·1	—	—	43·3	27·7	24·4	25·6
France. . . . .	23·1	18·1	0·5	—	5·8	2·7	3·6	1·6
Germany. . . . .	18·3	22·6	55·6	45·5	14·5	10·6	18·3	22·3
Holland. . . . .	15·9	18·0	23·4	21·5	7·0	8·2	4·4	8·7
Belgium. . . . .	6·6	5·8	1·7	2·1	7·6	6·3	5·6	3·4
Italy. . . . .	38·6	28·2	—	—	—	—	5·6	4·4

For further consideration the export of the principal cereals from Russia in 1889 and 1890 may be indicated as follows in millions of pouds:

Wheat.		Rye.		Oats.		Barley.	
1889	1890	1889	1890	1889	1890	1889	1890
190·4	181·9	84·3	76·9	70·1	51·9	65·8	60·7

From the foregoing it may be seen that the importance to Russia of the prin-

cial countries of consumption may be indicated in the following percentages of the entire Russian export:

C o u n t r i e s .	W h e a t .		R y e .		O a t s .		B a r l e y .	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
	I n p e r c e n t s .							
Great Britain . . . . .	34·8	33·1	—	—	61·8	53·5	37·0	42·2
France . . . . .	12·2	10·0	—	—	3·9	5·2	5·5	2·6
Germany . . . . .	9·6	12·4	66·0	59·0	15·1	20·4	27·7	36·8
Holland . . . . .	8·4	9·9	27·7	28·0	11·7	15·8	6·7	14·4
Belgium . . . . .	3·5	3·2	2·0	2·7	8·7	11·9	8·5	7·2
Italy . . . . .	20·4	15·5	—	—	—	—	—	—

From the above table it is evident that Great Britain is of the first importance to Russia with reference to all cereals except rye. In the five years from 1883 to 1887 the first place was held by Germany in this particular, as of the four above-mentioned cereals there was exported to Germany an average of 77,800,000, and to Great Britain, 69,200,000 pouds. In 1890, on the contrary, the import of Russian cereals to Great Britain was greater than that to Germany, being respectively 113,400,000 and 101,000,000 pouds. Therefore, Germany in 1890 occupied only the second place in this respect, but the first place as regards rye, of which the consumption was about 60 per cent of the entire rye export. The third place belongs to Holland; France and Italy are of considerable importance to the grain export trade of Russia only in wheat; while Belgium imports only barley and oats in any considerable quantities.

The total import from all the countries of the world of the four principal cereals to the below-named countries in 1889 and 1890 was as follows:

C o u n t r i e s .	W h e a t .		R y e .		O a t s .		B a r l e y .	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
	M i l l i o n s o f p o u d s .							
Great Britain . . . . .	181·7	187·5	—	—	49·6	39·5	54·0	51·7
France . . . . .	69·6	64·4	1·3	0·1	12·5	9·1	11·3	10·5
Germany . . . . .	31·5	41·0	64·6	54·4	15·7	11·4	39·7	44·8
Holland . . . . .	41·2	43·5	37·4	27·4	7·7	10·2	15·2	16·2
Belgium . . . . .	46·8	54·7	6·6	5·6	20·1	24·3	12·5	13·4
Italy . . . . .	53·2	39·3	—	—	1·2	1·8	0·9	0·6

In comparing the above figures with those indicating the import of Russian cereals into each of the countries mentioned, the following percentages of the grain export of Russia as compared with other countries would result:

C o u n t r i e s .	W h e a t .		R y e .		O a t s .		B a r l e y .	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
	I n p e r c e n t s .							
Great Britain. . . . .	36·4	32·1	—	—	87·3	70·2	45·1	49·5
France. . . . .	33·1	28·2	—	—	46·5	29·1	38·8	15·9
Germany. . . . .	58·9	55·9	86·1	85·7	92·3	93·4	47·9	49·8
Holland. . . . .	38·6	41·3	62·7	78·4	91·1	80·7	57·0	53·6
Belgium. . . . .	14·2	10·7	25·7	37·5	—	—	42·5	32·9
Italy. . . . .	72·6	71·8			53·1	42·5		

The importance of Russia to each of the European countries with regard to each of the principal cereals is consequently very great, much greater, as seen by comparing the foregoing tables, than the importance of each of these countries to Russia.

## CHAPTER VIII.

**Other field produce.**

Flax for fibre and for the seed; hemp, cotton plant, sunflower, rape, turnip and wild mustard; mustard plant, garden cress, poppy, tobacco, beet, hops, aniseed, cumin, mint, chicory, teasel.

## FLAX FOR FIBRE AND FOR GRAIN.

**F**LAX culture forms one of the principal branches of farming in Russia. This industry dates back to remote times as regards the manufacture of flax cloths and oil for domestic use. Already in the sixteenth century it became a trade, supplying not only the local manufactories but also some of the foreign markets with flax in the raw state. At the end of the last century the yearly export of flax amounted to about 1,000,000 pouds; in the twenties it attained 2,000,000, and in the fifties it reached 4,000,000 pouds. But since the liberation of the serfs the flax trade began to develop greatly in Russia. Although from that time many of the landowners were compelled to lessen the amount of their tillage in general, as also the area under flax, nevertheless the peasants took with pleasure from the proprietors newly ploughed lands and deserted cornfields for flax cultivation. In 1865 the export of flax and of tow attained 7,267,154 pouds, and in 1870 it grew to 11,512,408 pouds.

In the beginning of 1880, 1,400,000 dessiatines were sown with flax in European Russia, excepting the Kingdom of Poland and the Grand Duchy of Finland, from which nearly 18,000,000 pouds of fibre were gathered, and 14,000,000 pouds were exported. However, from that very time a visible decrease in flax-sowing was observed, which has only recently been checked. This decrease was due to the rise in the prices of cereals and to the small demand for flax seed and filament. By the data of 1886 in the fifty governments of European Russia, 1,033,500 dessiatines were under flax, of which there were in the twenty-five Chernoziom governments 326,800 dessiatines, and in the twenty-five non-Chernoziom governments, 726,700 dessiatines.

Thus nearly three-fourths of all the flax fields are in the non-Chernoziom or northern zone of Russia. Moreover, there should be added 26,850 dessiatines sown with flax in the Kingdom of Poland, nearly 6,000 dessiatines in Finland, and about 100,000 dessiatines in Siberia.

The Chernoziom zone mostly produces the so-called curly flax (*koudriazh*) which produces a large proportion of grain, but a very short stem not good for fibre.

On the contrary in the non-Chernoziom regions the flax *dolgunets* is sown, the value of which is in its filament. As may be seen from the annexed map, in European Russia flax culture for fibre is chiefly concentrated in two regions, of which one, the north-eastern, embraces the following governments: Viatka, Perm, Vladimir, Yaroslav, Kostroma and Tver; the other, in the west, the governments of Pskov, Livland, Kovno, Smolensk and Vitebsk. However, in the non-Chernoziom region there are two districts, on the borders of the White Sea, in which flax is not cultivated.

The harvest of fibre from a dessiatine forms on the average seventeen pouds, decreasing in the southern governments, where grain is the principal product, to fourteen pouds and less. The total quantity of flax fibre produced in Russia may be expressed in the following figures:

In the non-Chernoziom zone of European Russia about . . . . .	13,000,000 pouds
» Chernoziom » » » » . . . . .	2,500,000 »
» Kingdom of Poland . . . . .	0,400,000 »
» Finland . . . . .	0,100,000 »
» Siberia . . . . .	1,500,000 »
<hr/>	
Total. . .	17,500,000 pouds.

By taking into consideration that the principal countries of Europe, except Russia, produce about 13,710 thousands pouds of flax fibre, and that other non-European countries produce none, except Argentina, where about half a million pouds are grown, it will be seen that the universal flax product cannot be above 32,000,000 pouds, of which more than half is raised in Russia. The fibre of the New Zeland flax is not taken into consideration, as it is produced from a different plant.

The various sorts of fibre grown in Russia depend principally upon the manner of the working and finishing of the raw material. The method mostly used for preparing the fibre is the stretching process. The wetting of flax is less used; in the most parts of the eastern flax regions the wetting of flax is quite unknown; it is also little used in the south of the western region. Depending upon the two-mentioned methods of dissolving the gummy substance, which joins the separate primitive fibres to one another and also the filament to the stem, two sorts of flax are distinguished: flax-*stlaniets*, (stretched) and flax-*mocheneets* (wetted). Depending upon the degree of the finish of the fibre, it is called raw flax (*syrrets*), stripped flax, and combed flax. What remains after flax is stripped and after the first combing, is called tow (*paklej*), and the finest and cleanest parts of the filament which remain after a prolonged combing are called *koudei*.

In Russian commerce flax is divided into more than a hundred different sorts or marks of which only a few show much difference in the quality; it often happens that flax of the same quality, but coming from different localities and transported to different markets, bears different names, or sometimes flax bearing the same mark is of different quality. Thus for example, flax with the mark HD (Hofs dreiband superior) is on the Riga market of a different quality from that with the same mark in Pskov, Reval, Pernau and Koenigsberg; but in general these marks serve for regulating the price.

In consequence of the great variety of flax grades, the prices are also very different, not mentioning the fluctuation of the prices due to the crops and the demands for fibre. Thus, on the St-Petersburg markets the prices for a *berkovets* (400 Rus-

# CULTIVATION OF FLAX.

Chapter VIII. Other Field Produce, Map №1.

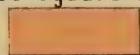
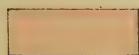
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Total area occupied by flax in 1886 in each government  
per 100 square versts.



Less than one  
dessiatine

1-24

25-49

50-100

Over 100



sian pounds) were for different sorts of flax: in 1885, from 17 to 64 roubles; in 1886, from 18 to 68 roubles; and in 1889, from 18 to 51 roubles. If in Riga a berkovets of flax with the mark K (Kron) costs 45 roubles, the mark GSPK (Gran Superior Puik Kron) costs 55 roubles and DW (Dreiband Wrack) not more than 32 roubles.

As to origin, flax from the northern and eastern governments is the most prized, as for example, that from Archangel, Olonets, Vologda, Kostroma, and Yaroslav; and from the western governments, that from Pskov, Livland, Courland and Grodno.

The average price of flax from Archangel, St. Petersburg and Riga markets was in paper money for a berkovets, from 1862 to 1866, 40·20 roubles; 1867 to 1871, 39·45 roubles; 1872 to 1876, 39·36 roubles; in 1877 to 1881, 33·25 roubles; 1882 to 1886, 28·47 roubles; 1887 to 1890, 26·40 roubles. During all these years, from 1862 to 1890, the prices of flax gradually decreased. A similar decline was also noticed for foreign flax; thus for example, a berkovets of Belgian flax cost in 1880 about 84 roubles gold, and in 1888, not more than 55 roubles gold; for French flax the price fell during the same years from 78 to 37 roubles; and for Hollandish, from 69 to 58 roubles per berkovets. The principal reason for this decline was the depreciation of flaxen fabrics, because of a great concurrency of stuffs fabricated from cotton and other similar materials, which in their turn are also gradually losing their price on the markets.

There are no precise data for showing the quantity of flax used in Russia, but admitting 17,500,000 pouds as the yearly average production during the last ten years, and the average export of flax and tow, 11,300,000 pouds, one may consider that about 6,200,000 pouds are used for local needs in flax products. The greater part of these 6,200,000 pouds, namely about 3,500,000 pouds, are worked into linen, ropes and other objects for the use of the manufacturers themselves; part is bought and worked by the peasants who do not raise flax; and about 1,800,000 pouds are manufactured and mostly used by the town inhabitants.

As to the interior organisation of the flax trade, the producers of flax in the raw state very seldom have direct dealings with the manufacturers or exporters. Between the farmer and the consumer there exists a whole line of middlemen, who speculate principally on the difference between the purchase and the selling price, not caring much for the quality of the material. Commercial firms, leading the flax trade at their own risk and with their own capital, exist only in large commercial towns, although even there the number of such firms has visibly decreased of late, and the middlemen have taken their places to a large extent, and who ply the export trade in the same manner as the agents between the seller and the buyer at the place of production. These middlemen, not having money enough to buy large quantities of flax sufficient to examine, assort and grade properly, and to export definite, reliable brands separately, ship it as they get it from the producers, with no efforts to improve it in any way. As such defects in the trade export business greatly influence the market price of flax and consequently the earnings of the producers, the Government has taken the necessary steps for improving the finish, by organising stations and farms for flax manufacture and also for bettering the flax trade in general.

As said above, from 3,000,000 to 4,000,000 pouds of the total flax produce in Russia are used by the flax producers themselves yearly, so that in years of mean harvests about 14,000,000 pouds remain for the export trade. The same conclusion may be drawn with reference to the quantity exported by examining the reports of flax transport by

the different ways of communication, of which railroads are the principal, about 11,000,000 pouds being carried in that way; the transport in carts to the places of export covers about 1,800,000 pouds, and by the interior water ways, about 1,200,000 pouds.

The principal railroads for local transportation are the lines: St-Petersburg and Warsaw, Rybinsk and Bologoe, Moscow and Vologda, Moscow-Brest, Libau-Romni, Dunaburg-Vitebsk and Riga-Dunaburg; the principal export stations are: Ostrov, Pskov, Dunaburg, Vitebsk, Rybinsk, Viazma and Bezhetsk. The principal points of destination of railway transport are the ports: Riga, Reval, St-Petersburg and Libau.

The quantity of flax transported by rivers decreases yearly. Among the interior water ways the Volzhsko-Nevsko-Severno-Dvinskaia River and Canal system is the principal. The greatest part of the river stations serve only as transmitting points for railway transport, as only Archangel, St-Petersburg and Riga export by sea, and not by railroad, the flax that has come by water.

As to the export trade of flax it is to be observed that, although it has been subjected in different times to considerable fluctuations, in general it has rapidly increased, from the beginning of this century to 1850 four times, and from 1850 to 1880 three times. The fluctuations in the export from 1882 to 1891 can be seen from the following data:

Years.	Flax.	Tow.			Total.
		P	o	u	
1882 . . . .	12,133,001		1,506,349		13,639,350
1883 . . . .	10,969,317		1,487,763		12,457,080
1884 . . . .	11,114,179		1,667,782		12,781,961
1885 . . . .	9,354,131		1,933,786		11,287,917
1886 . . . .	7,110,455		1,512,353		8,622,808
1887 . . . .	8,587,805		1,859,401		10,447,206
1888 . . . .	11,304,396		1,854,131		13,158,527
1889 . . . .	11,220,642		1,258,561		12,479,203
1890 . . . .	12,128,862		1,176,195		13,305,057
1891 . . . .	11,332,472		1,377,384		12,709,856

The greatest export is from the ports of the Baltic Sea, though that from the west overland frontier has lately attained very considerable proportions. Thus, of the whole flax export in 1891, from the Baltic ports 60 per cent, from the overland frontier 38 per cent, and from Archangel 2 per cent have been exported. From the ports of the Black and Azov seas only occasionally flax has been shipped abroad.

The principal points of flax export taken separately are the following towns: Virballen, Riga, St-Petersburg, Reval, Pernau, Graevo, Sosnovizi, Libau and Archangel.

The Russian flax export trade can be divided in the following manner, as to the countries importing flax: to Germany about 4,400,000 pouds are yearly exported; to Great Britain, 3,870,000 pouds; to France, 1,500,000 pouds, to Belgium, 800,000 pouds, to Austro-Hungary, 300,000 pouds, and to different other countries about 400,000 pouds.

It has been mentioned above that in the vast regions of Russia the principal product in flax is not the fibre, but the seed; in general the importance of flax seed is only 35 to 40 per cent of that of flax fibre. The price of the 15,900,000 pouds of flax, produced in European Russia and in Poland, is 48,000,000 roubles; on the same area about 23,000,000 pouds of flax seed are harvested with a value of 30,000,000 roubles.

From 1888 to 1891 the flax seed harvest fluctuated in the following manner:

	1888.	1889.	1890.	1891.	Aver- age.
	In thousands of pouds.				
Non-Chernoziom regions of Russia in Europe . . . .	11,794	15,077	14,764	13,652	13,822
In the " " " " . . . .	15,685	8,428	5,825	3,518	8,364
In Poland " " " " . . . .	870	767	1,027	912	894
Total . . . .	28,349	24,272	21,616	18,582	23,080

In 1888, 22,052,000 pouds of flax seed were exported; in 1889, 23,978,000 pouds; in 1890, 21,989,000 pouds; in 1891, 14,957,000 pouds, and the average quantity exported during the four years mentioned was 20,744,000 pouds. Consequently the export is 90 per cent of the total production; and from 1888 to 1891 flax seed was exported in the following proportions: to Great Britain, 9,944,000 pouds, to Germany, 2,812,000 pouds, to Holland, 3,975,000 pouds, to Belgium, 2,000,000 pouds, to Denmark 703,000,000 pouds, to France, 582,000 pouds, to Sweden, 473,000 pouds and to other countries, 255,000 pouds.

In supplying the international market with flax seed Russia occupies the second place, the first belonging to the East Indies, in consequence of which the import from Russia to the Great Britain market formed in 1890, 42 per cent, and in 1891, not more than 21 per cent of the total import.

More than two-thirds of the total Russian export of flax seed goes from St. Petersburg, Riga and Libau; from the ports of the Black and Azow seas, principally Odessa, Nicolaev and Rostov, 20 per cent of the total export; from the customhouses of the west overland frontier, as Graevo, Virballen, Sosnovizi and Yurbourg, about 8 per cent, and from Archangel about 2 per cent of the total export is shipped.

Russia exports, besides the fibre and the seed, linseed oil and the oil residues. In 1891 the linseed oil export from European Russia was 35,481 pouds, of which 490 pouds were sent to the countries of western Europe, and 34,991 pouds to Finland. The export of oil residues attains greater proportions; thus, in 1891, 4,205,143 pouds were exported to Western Europe, 64,110 pouds to Finland, total 4,269,253 pouds. The principal ports for the export of residues are Riga, St-Petersburg, Libau and Reval; by the overland frontier the greatest export is from Alexandrovsk and Mlava. As to the foreign markets where residues are imported, about 80 per cent of the total quantity is sent to Great Britain and Germany, about 15 per cent is exported to Denmark, and the remaining quantity to Belgium, France and other countries.

#### H E M P.

The production and the manufacture of hemp fibre forms a very important branch of Russian agriculture. The cultivation of the plant, which requires great manual labour, is principally in the hands of the peasants, and occupying in separate households small areas; it is dispersed in all the governments of European and also in the greater part of Asiatic Russia.

The total area sown with hemp in the fifty governments of European Russia forms, according to the data of 1886, 423,000 dessiatines, of which 364,000, more than 86 per cent, are in the governments of the Chernoziom region where hemp has the same importance to the peasants as flax in the northern parts of Russia, there being 58,500 dessiatines under hemp in the non-Chernoziom region, and of these, 30,000 dessiatines are in the governments of Perm, Viatka and Smolensk. In general, as may be seen from

the accompanying map, the principal region where hemp is produced occupies a wide strip in the non-steppe parts of the Chernoziom region, limited on the west by the government of Podolsk and on the east by that of Simbirsk.

Concerning the productiveness of the hemp fields the data from 1885 to 1889 show that in the Chernoziom region the average harvest was 19·2 pouds per dessiatine, the fluctuation in the different governments being from 13·5 to 25·2 pouds; and in the non-Chernoziom regions 17·9 pouds, the fluctuations being from 12·5 to 23·1 pouds per dessiatine. The total yearly hemp production in Russia in Europe, including Finland and the Kingdom of Poland, attains 8,500,000 pouds. In all the other countries in Europe the yearly production of hemp is 12,690,000 pouds, and consequently in the whole of Europe, 21,460,000 pouds.

Thus, by the quantity of hemp produced, Russia occupies the first place of all the countries in Europe; her production is more than 40 per cent of the total quantity.

The sorts of hemp, as distinguished at the places of production, as also in the hemp markets, are real hemp and male or common hemp. The latter, which is produced from the male plant has no trade importance, and the tissues made from it are exclusively used by the peasants themselves, especially in the southern governments. Real hemp is divided: 1. according to the manner in which the seed head is separated from the stalk, into *sechko* and *molochnika*; in the first instance the heads are cut off immediately after harvesting, and in the second they are thrashed, being preliminarily dried on the stems; 2. according to the time of the working of it, into *zemniak* and *veshniok*; the first is wetted in autumn, dried in cornkilns or barns, scutched and peeled during the winter; the second is wetted in spring and undergoes the remaining process of preparation during summer; 3. according to the degree of finish hemp is divided into raw, scutched and combed. The residue left after hemp has been combed, is sold under the name of tow. Scutched hemp has the best sale, and is worked in some regions into yarn, which serves for rope-making.

In the hemp markets the above mentioned varieties are divided into many grades by trade-marks, which show the quality of the merchandise, the place of its production, and also sometimes the place of its destination. Thus, for example, the mark FSPRH signifies thin, soft, polish, clean, hemp.

The average hemp prices in the places of production, as also in the greater part of the interior markets from 1885 to 1889, in the Chernoziom and non-Chernoziom regions were as follows:

Years.	Chernoziom region.		Non-Chernoziom region.	
	Average price for the whole region.	Fluctuation of prices in differ- ent govern- ments.	Average price for the whole region.	Fluctuation of prices in differ- ent govern- ments.
		P a p e r   r o u b l e s	p e r   p o u d.	
1885 . . . . .	2·20	1·50—2·85	3·15	1·80—4·80
1886 . . . . .	2·25	1·60—3·27	3·35	2·00—5·00
1887 . . . . .	2·10	1·38—2·70	3·25	1·85—4·50
1888 . . . . .	2·10	1·35—3·20	2·90	2·00—4·45
1889 . . . . .	1·80	1·35—2·60	2·70	1·55—4·70
1890 . . . . .	1·47	1·05—2·05	2·85	1·75—5·10
Average. . . . .	1·97	1·05—3·27	3·03	1·75—5·10

# CULTIVATION OF HEMP.

Chapter VIII. Other Field Products, Map No. 2.

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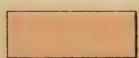
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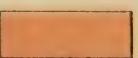
Total area occupied by hemp in 1886 in each government  
per 100 square versts.



Less than one  
dessiatine



1-24



25-49



50-100



Over 100



Consequently, on the average, hemp has been sold a rouble cheaper in the Chernoziom regions than in the non-Chernoziom, although the local prices are so variable that not only in the same government, but even in different villages of the same district, the difference in the market prices is sometimes very considerable.

By examining the yearly movement of prices it can be observed that lately they have lowered considerably, due principally to the same causes as obtained for the lowering of flax prices as mentioned above, namely, the general depreciation of all rural products and the concurrency of the Manilla hemp, jute, cotton fibre and other kindred materials, which lessen the demands for Russian flax and hemp. By comparing hemp and flax prices it may be seen that the first are generally 10 per cent lower than the second. Thus, on the average during the last five years the price of a berkovets of flax fluctuated on the Russian markets between 32 and 45 roubles, and that of hemp between 28 and 42 roubles.

The home trade of hemp is carried on in the same manner in Russia as exists with reference to the sale of all produce of the peasants, namely, by means of a series of middlemen, in as much as the peasants have no direct relations with the wholesale dealers. These flax agents buy of the different farmers in their respective localities and sell their purchases to larger agents, who in their turn sell the goods to different exporters that have representatives at the different central markets; thus the producer is wholly dependent upon the local demands. The hemp of the Russian peasant, therefore having passed through all these stages of bargain and sale is at last brought to the railway stations and to river ports, whence it goes to the different points of export or to the principal interior markets. In consequence of this practice it is impossible to follow all the stadia in the development of this trade; moreover there are also no exact data of the quantity of hemp used in Russia itself. A still greater difficulty presents itself in the efforts to study the different steps in the export trade of hemp, in the fact that in a great number of different manufactures, such as tick for mattrasses and furniture, tarpaulin, linen for pictures and the like, hemp is used, as well as flax, jute and other spinning materials, there being no possibility of defining the quality of hemp used in such manufactures. At all events it is certain that in the different manufactories of Russia not less than 2,500,000 pouds of hemp are consumed; therefore as the export is about 3,500,000 pouds, the total quantity of hemp and tow, used in commerce amounts, in years of mean harvest, to about 6,000,000 pouds.

More exact registers of the hemp trade are obtained from the moment when hemp is brought to the railway stations or river ports. From the statistics relative to the hemp trade, taken at railway stations and river and sea ports, it is seen that the principal markets for hemp, as well as the offices of the wholesale traders and the hemp mills, ropewalks and sack factories are generally established in the vicinity of the most convenient and cheap ways of communication.

In the transportation of hemp the railroads have a decided advantage over the water ways, and consequently hemp transport by water decreases from year to year. The importance of the different ways of transportation of hemp may be seen from the following table:

Years.	Transport in pouds.		
	By railroad.	Interior water ways.	Total.
	Pounds in thousands.		
1880 . . . . .	6,075	447	6,522
1882 . . . . .	6,157	441	6,598
1884 . . . . .	6,048	208	6,256
1885 . . . . .	5,330	270	5,600
1886 . . . . .	3,770	312	4,082
1888 . . . . .	6,058	204	6,262

Of the total quantity of hemp transported by railroad, about 41 per cent goes by the Orel and Vitebsk, 46 per cent is transported by the Koursk and Kiev, Moscow and Brest, Libau and Romny, Moscow and Koursk, Polesskaia, Morshansk and Sizran, and South Western railroads, and only 13 per cent goes by the other railways. The principal stations for hemp export are, Karachev, Orel, Roslavl, Briansk, and Smolensk, of the Orel and Vitebsk Railway, Lgov, Korenovo and Koursk of the Koursk and Kiev, and Terekhovka of the Libau and Romny railways. As to points of destination of Russian hemp, the most important are the following: Riga, St. Petersburg, Orel, Karachev and Moscow. Riga is supplied with hemp principally from the governments of Orel, Smolensk, Mogilev, and Chernigov; and St. Petersburg, from the governments of Koursk, Toula, Tambov, Riazan and Pensa.

The amount of the yearly export of hemp and tow from Russia to foreign markets fluctuated during the last century between three and four million pouds. Thus, on the average, from 1800 to 1804, 3,170,325 pouds were exported; in 1837 to 1841, 3,260,817 pouds; in 1857 to 1861, 3,158,700 pouds; in 1870 to 1874, 3,739,042 pouds; and and from 1882 to 1891 the export was as follows:

Years.	Hemp.	Hemp tow.	Total.
In 1882. . . . .	3,756,556	161,620	3,918,176
» 1883. . . . .	3,782,340	159,058	3,941,398
» 1884. . . . .	2,881,434	178,579	3,060,013
» 1885. . . . .	3,074,738	279,967	3,354,705
» 1886. . . . .	2,360,814	215,651	2,576,465
» 1887. . . . .	3,858,024	310,902	4,168,926
» 1888. . . . .	3,322,778	319,893	3,642,671
» 1889. . . . .	4,078,103	332,525	4,410,628
» 1890. . . . .	3,308,521	499,887	3,808,408
» 1891 . . . . .	3,429,349	547,342	3,976,691

Nearly the whole export of hemp and tow goes through the European frontier; two-thirds of the total quantity is exported by the west-overland frontier and the rest through the Baltic ports. As to the countries which consume Russian hemp, two-thirds of the total export goes to the German market, and of the remainder, more than half is sent to Great Britain.

In conclusion it may be noted that only Russia and Italy, of all the European

countries, have a fair hemp export; in all the other countries in Europe the import of hemp exceeds the export, and to such a degree that the total import into those countries is greater than the total export of all European countries, by more than 2,000,000 pouds, imported into Europe from other parts of the world.

The total harvest of hemp seed in European Russia was from 1888 to 1891 as follows:

	1888.	1889.	1890.	1891.
	P	o	u	d
In the Chernoziom region . .	15,665,629	13,449,299	9,278,110	6,151,659
» non-Chernoziom . . . . .	2,674,317	2,579,168	1,504,253	1,513,225
» Kingdom of Poland . . . . .	144,942	136,635	254,610	221,599
Total. .	18,484,888 *	16,165,102 *	11,036,973 *	7,886,483 *

As is seen from the foregoing table hemp production has rapidly decreased during late years; especially in 1891 was the harvest of hemp fibre and seed very unsatisfactory.

The export of hemp seed is not great; thus, in 1886, 1,061,000 pouds were exported; in 1888, 1,935,000 pouds; in 1889, 1,750,000 pouds; in 1890, 910,000; and in 1891, 1,116,000 pouds. The principal foreign markets for Russian hemp seed during the above-named years, were those of Germany, France, Great Britain and Austro-Hungary, and the principal points of export were Riga, Libau, Graevo and Odessa.

Besides hemp seed, hemp oil and oil residues are exported; from 1886 to 1891 such exports may be indicated as follows:

	Oil.	Residues.
In 1889 . . . . .	13,178 pouds.	949,606 pouds.
» 1890 . . . . .	9,190 "	990,375 "
» 1891 . . . . .	8,777 "	658,576 "

Oil is exported principally through Odessa and Oungeni to Roumania, and oil residues, to Germany, France, Great Britain and Denmark, and the principal points of the export of oil residues are Alexandrovo, Libau, Riga, Sebastopol and Mlava.

#### COTTON PLANT.

In Russia the cotton plant is grown in Turkestan and beyond the Caucasus. It has been cultivated in Turkestan from the most ancient times and probably began at that epoch when the Asiatic cotton plant, known under the name of *gossypium herbaceum*, began to develop itself gradually on the borders of Oxous (Amou-Daria) and Seikhoun (Syr-Daria), coming to the north from the south of Asia.

During many ages, which followed the entrance of cotton into Turkestan, the plant became quite acclimated thus far north. It produced several varieties and contributed much to the welfare of the inhabitants, who cultivated it over all the country, as far north as possible, and cotton fibre was exported to the neighbouring countries. During this so-called ancient period of cotton cultivation there were no cotton-growers who occupied themselves exclusively with this branch of agriculture. It was grown on lands

\* The total of 1888 does not include the harvest in the governments of Kostroma and Podolsk; that of 1889 excludes the harvest in the governments of Warsaw, Kalish and Plotzk; that of 1890 excludes that of Vladimir, Kourland, Kalish and Plotsk, and that of 1891 excludes that of Estland and Kalish.

not occupied by produce of prime necessities, such as wheat, rice, barley, vegetables and other staples.

Such was the state of cotton-growing in Turkestan before the Russians entered that territory; it decreased and increased according to the prices and demands from other countries, especially from Russia. This branch of agriculture attained its greatest development in Turkestan in the years 1860, when the Russian cotton trade was undergoing a severe crisis, in consequence of a great decrease in the import of cotton fibre from America. As the prices of cotton were very high at that time, its manufacture increased in Bokhara, Khiva, Kokantskoe Khanstvo, and also beyond the Caucasus, to such a degree that the crisis passed more or less fortunately. After Turkestan was conquered by Russia the quantity of cotton grown decreased rapidly, for many different reasons, and especially because of the decline in the prices. When the Russians took full possession of Turkestan, great attention was paid to the development of cotton-growing, as it was of great importance not only to that province itself but also to Russia, which had to buy cotton abroad, in the United States and in Egypt. Just at that time came the idea of introducing into Turkestan the American cotton plant, which was of superior quality to the local varieties. During ten years all attempts to cultivate American cotton in Turkestan were unsuccessful for many reasons and especially from the desire to grow the so-called Sea Island cotton, *gossypium barbadense*, which was unable to weather the dry climate of Turkestan. Only in 1880 it was learned that the Upland cotton, *gossypium hirsutum*, could be successfully grown there, and immediately energetic measures were taken for its cultivation. In Tashkend a cotton plantation was established; manuals for the culture of the American Upland cotton were published in Russian and in the local languages, and seed was distributed free of cost to those who desired it, and moreover the sale of cotton fibre from American seed was guaranteed.

Such energetic measures had little by little the desired results. There were several large planters who cultivated cotton exclusively, and measures were taken for improving the cleaning and assorting of the fibre. Gins were ordered from the United States, and the most important result was that cotton fibre from Turkestan, grown from American seed, had a great influence on the Russian market, and the price thereof was much higher than that of the Asiatic species. The construction of the Transcaspian Railroad had an important bearing also on the increase of cotton-growing in Turkestan. To what degree the cultivation of Upland cotton has increased may be seen from what follows: in 1884 not more than 300 dessiatines were sown, 44,500 dessiatines being under Upland alone, the area being thus increased 148 times. In the following year, 1890, more than 90,000 dessiatines were sown in Turkestan with Upland, and with the native cotton, from which more than 1,200,000 pounds of clean fibre were collected.

The sowing and harvest of cotton were divided among the territories, as in the table below:

	D e s s i a t i n e s .		P o u d s .	
	U p l a n d .	L o c a l .	U p l a n d .	L o c a l .
Territory of Syr-Daria . . . .	18,100	1,900	227,806	1,900
»    » Fergan . . . . .	34,820	18,649	604,000	206,000
»    » Samarkand . . .	5,939	11,469	93,900	132,000
Total in Turkestan . .	58,859	31,958	924,806	358,000

Remembering that the sowings of Upland and of cotton in general are constantly increasing, it may be assumed without any danger of falling into error that the area under cotton in Turkestan in 1892 was more than 100,000 dessiatines, of which three-quarters were of the different sorts of Upland, and one-quarter, of the local varieties. The quantity of cotton fibre received from this area may be approximately calculated at a little over two million pouds, the greatest quantity being grown in the Fergan territory, and the least, in that of Syr-Darya. The production of cotton in Turkestan will, in all probability, increase still further in the future, but it must be observed that the increase of the plantations can only be carried to a certain limit, as there remain comparatively few artificially irrigated lands suited to cotton-growing. With a more rational employment of the existing supplies of water, especially those from the river Syr-Darya, and with the construction of new irrigation systems, the quality of cotton produced by Turkestan may be considerably increased and reach at least six to seven million pouds. The local Asiatic cotton plant is grown in several different varieties, but in the trade it usually bears the name of its place of origin, as for example Tashkend and Kokand cotton. The kinds of Upland grown are fairly numerous, among the commonest being New Orleans, Ozier Silk, Peterkin, Texas, Dixon and Duncan's mammoth prolific.

The methods of cultivation of the cotton plant in Turkestan are exceedingly various and have not yet been definitely fixed. The more intelligent growers seek as far as possible new paths in this direction, adopting different systems of ploughing and preparation of the soil, and of sowing and irrigating, in the hope of thus obtaining better results. Nevertheless, on the whole, notwithstanding the universal distribution of the cotton plant and the appearance in the country of a number of persons especially occupying themselves with the production of the fibre, the methods of cultivating it have changed comparatively little, and are being very slowly perfected.

The preparation of the field with improved implements, the manuring of the soil, the careful selection of seed, and rational methods of cotton culture in general are only to be seen on the plantations of a few Russian growers, more numerous in the neighbourhood of Tashkend, but to be met with only here and there in the territories of Fergan and Samarkand. The majority of the local planters break up the soil with the aid of primitive Asiatic wooden ploughs, with cast steel shares, harrow the field with a single board, cover over the seed with the hand, apply manure only in exceptional cases, pay no attention to the choice of seed, sow broadcast, in a word, make use of the most primitive methods, which however, in consequence of the exceedingly favourable conditions of soil and atmosphere for the cotton plant occurring in Turkestan, very often leads to satisfactory harvests. On the whole, the following operations in order of time are carried out in Turkestan, the sort of cotton principally in view being Upland: first, autumn irrigation, if necessary on account of the condition of the soil; second, autumn ploughing, not always resorted to, as the natives very rarely plough in the autumn; third, ploughing and harrowing; fourth, the division of the field into beds, a process not universal, the sowing of cotton in beds being still an open question in Turkestan; fifth, irrigation; sixth, sowing and covering the seed; seventh, irrigation; eighth, thinning the young plants, hoeing and weeding; ninth, irrigation; tenth, hoeing; eleventh, irrigation; twelfth, hoeing; thirteenth, the cutting and nipping of the tops of the sprouts, not everywhere practiced; finally, cotton-picking. The number of irrigations depends upon many different

conditions, but in the majority of cases does not exceed three or four after sowing. The latter operation is commenced, here and there, as early as the 20th of March, but the average season for sowing for the whole region is the middle of April, old style.

The cotton crop is dependent upon exceedingly various causes, among which the chief is perhaps the condition of the weather in September, October, and November. If the autumn is warm, and there are no frosts, the harvesting of the crop may go on till December; while if frosts appear at the end of September, the yield becomes unsatisfactory both as to quantity and quality. Early frosts occur most frequently in the more northern part of the region, near Tashkend, where in consequence of this circumstance the average crop is somewhat less than in the more southern localities. Rains hardly ever have an injurious influence upon the crop, as in general, clear and rainless weather continues during the whole time of its growth and ripening. Besides frosts, a not unimportant influence upon the cotton crop is exercised by insects, among which the caterpillars of the moth, (*Heliothis armigera*, Hüb n) in some places are the cause of considerable damage to the plantations.

The average crop of Upland in the Syr-Darya territory may be taken as 14 to 16 pouds of pure fibre per dessiatine, while that of the local plant is 12 pouds. In the Fergan and Samarkand territories the average yields from the same area are from 15 to 18 pouds of Upland, and 14 to 15 of the local. In individual cases, particularly when the autumn is warm and free from frosts, considerably heavier crops are obtained. Cases have occurred of so much as 36 pouds of pure Upland and 32 of local cotton being collected per dessiatine. The cotton after gathering from the fields is subjected to the process of cleaning from the seeds in the case of Upland, or from the husks and seeds in that of the local Asiatic variety. Almost all the local cotton is cleaned by wooden machines worked by hand which although not efficacious are very cheap. Nearly all the Upland and a part of the local varieties are sent to special cotton-cleaning mills where they are treated by jennies moved most often by water, sometimes by animal power or by hand, rarest of all by steam. The cotton-cleaning mills are situated mainly in the towns serving as the centres of the cotton-growing districts. Some however occur in large settlements, around which there are extensive plantations of cotton. The greatest number of these mills occur in Tashkend, Kokand, Namangan, Andizhan and Margelan. At the present time the whole of Turkestan contains about one hundred mills, in which more than four hundred and twenty jennies and one hundred and twenty presses are at work. The majority of the jennies are imported from the United States, but here and there machines are in use constructed in European Russia. The seeds left after the cleansing of the cotton are employed for sowing, for the production of oil, and the worst sort for fuel; the waste goes to feed cattle. The presses are mostly worked by hand, there being not more than ten hydraulic presses in the whole country. The cotton is pressed into bales of seven to nine pouds weight which are then despatched to Samarkand, the terminus of the Transcaspian Railway, upon the backs of camels or in arbas (a sort of high cart, with very long axe). A camel carries two bales of cotton, or fourteen to sixteen pouds, an arba thirty-five to forty pouds.

The transport of cotton to Samarkand is very slow, the difficulties of the road being much increased in autumn. The periodical delivery of cotton at the railway station in Turkestan cannot yet be thought of. The projected line from Samarkand to Kokand,

one of the most important centres to which cotton flows from the whole Fergan territory, will considerably improve and cheapen its delivery to the Transcaspian Railway and consequently to European Russia.

In reviewing the cotton trade in Turkestan, the first thing to be observed is that plantations of over one hundred dessiatines are met with, as an exception only near Tachkend, and here and there in the Fergan territory. They belong to Russian planters and trading firms. The vast majority of plantations consist of small plots of land, of from one-half to five dessiatines, and are cultivated by the natives. The small growers, who nevertheless supply not less than ninety per cent of the total production of the country, bring their cotton to the bazars in the settlements and towns where it is bought up either by small buyers or by the agents of the large Russian firms. The greater quantity is bought at the bazars for ready money, at the same time not unfrequently accounts are settled otherwise. In the cotton trade various loan agencies are in use. Thus trading firms and individuals are in the habit of giving loans: 1. upon the crop, the grower binding himself to pay the loan in future cotton at a certain price with interest; 2. upon cotton given to a trading or carrying firm upon commission, for which interest is taken; 3. upon a receipt for cotton delivered to a firm of carriers for despatching, in which case also interest is charged. The total amount of the loans is however not large.

The cotton bought up in the bazars is transferred to the mills for cleansing from seeds and for pressing. It is then delivered to the towns where are established the transport offices undertaking the delivery to the markets of European Russia. The chief centres of activity of the trading firms and transport offices are Tashkend, Kokand, Samarkand, Bokhara, for the dominions of the Khan, and the station of Amy-Darya on the Transcaspian Railway, for the territories of the Khan and Khiva. The cotton so exported from Turkestan is bought directly by the Moscow and Lodz manufacturers, or delivered on commission to middlemen who again sell it to these firms. The manufactories of European Russia receive cotton not only from Russian Turkestan but also from other countries of Central Asia, namely, Bokhara, Khiva and the Transcaspian territory.

Bokhara produces about one and a half million pouds of cotton; the Upland sort being here very rare, nearly the whole quantity is from the Asiatic plant. There are twenty-three cotton-cleaning and pressing mills situated in the largest centres of the Khan's dominions: Bokhara, Karakul, Permes, Chardzhui and the Bokharan stations on the Transcaspian Railway. Nineteen jennies and twenty-six presses, mostly worked by hand, are in operation in these mills. The activity of the Russian trading and transport firms is chiefly concentrated in the town of Bokhara. The whole of the cotton exported from Bokhara is despatched by the Transcaspian Line. The Khanate of Khiva produced about six hundred thousand pouds of cotton, almost exclusively of the native variety. The cotton plant grown in Khiva presents a peculiar sort of the local Asiatic, considerably excelling in its properties the other central Asiatic growths.

One portion of the Khivan cotton, and that the greater, is sent into Russia through Orenburg on camels, the other and lesser portion going by boats by way of the Amy-Darya to the station of that name on the Transcaspian Railway. The Transcaspian territory yields not more than ten thousand pouds of cotton, mainly from the Upland variety in the neighbourhood of Merv. Thus all the central Asiatic countries together produce over four million pouds of cotton, more than three-quarters of this quantity

being exported to European Russia. In 1890 the export to European Russia of clean cotton constituted from Turkestan about 1,182,543 pouds, from the Khivan Khanate 503,089, mainly through Orenburg, from Bokhara 1,381,569 and from the Transcaspian territory 5,073 pouds, or in all 3,072,274 pouds from Central Asia. The whole of this cotton, with the exception of the greater part of that from Khiva, is despatched by the Transcaspian Railway as far as Uzun-Ada, whence by various routes it is delivered to the manufacturing districts of Moscow, Lodz and Warsaw. The directions taken by the cotton on its way from Uzun-Ada to the Moscow district are: 1. by the Caspian Sea and the Volga to Nizhni-Novgorod and Yaroslav; 2. by the Caspian Sea to Baku; 3. by the Transcaucasian Railway through Batoum or Poti to Sebastopol and further by rail; 4. by the Caspian Sea through Baku by the Transcaucasian Railway to Batoum or Poti, thence to Odessa and further by rail; Warsaw and Lodz are reached by the second and third routes.

The expenses of production, including picking, cleansing and the like, of Upland cotton in Turkestan, on the estates of the Russian growers, fluctuate between seventy-five and ninety roubles per dessiatine, in exceptional cases reaching one hundred roubles; the natives, whether cultivating Upland or the local cotton plant, expend considerably less, as they do their own work. With them the cost of production is never more than fifty roubles, and very often much less per dessiatine. The net profit obtained from the cultivation of cotton depends upon very many different causes but most of all upon the crop. When the latter is good, not only are all expenses of production covered, including carriage to the markets, interest on foundation and floating capital and repairs of plant, but there remains a very considerable clear income. In case of a bad harvest the net profit diminishes and at times there is no profit whatever, which is sometimes the case in the northern part of Tashkend, in consequence of early frosts or other causes. The average approximate cost of production per poud of Upland upon the spot may be taken at five roubles; the cost of carriage to Moscow with all the general expenses is about two roubles, so that the cost per poud of Upland in Moscow is seven roubles. Remembering that the selling price per poud of Upland in this market is about nine roubles and forty kopecks, it results that the grower by selling his cotton in Moscow clears about 2:40 roubles a poud, which means 36 roubles per dessiatine, with a crop of fifteen pouds.

Another very considerable district for cotton culture in Russia is Transcaucasia where the Asiatic cotton plant has been grown from the most ancient times, and where Upland has been introduced only lately. There are about 35,000 dessiatines under cotton in Transcaucasia the greater part of which falls to the Erivan government, which supplies more than nine-tenths of the cotton produced in the country. Furthermore, small patches of cotton are met with in the governments of Elisavetpol, Baku, Kutais and even Tiflis. The total production in Transcaucasia is about 600,000 pouds, more than half of which is Upland, the rest being from the local plant, and Jumel which is cultivated in small quantities only in the Kutais government. The average crop from one dessiatine may be assumed as about fifteen to twenty pouds of Upland, the local plant yielding somewhat less. Cotton cleaning-mills, having at their disposition a number of jennies, do not exist in Transcaucasia. The cotton is cleaned upon jennies scattered in the different settlements, and in general in the centres of production of the cotton. About nine-tenths of the whole amount of cotton obtained in Transcaucasia is exported to the

manufactories of European Russia through Baku. Cotton-growing in Transcaucasia is gradually though slowly developing; the methods of cultivation are being perfected and the quantity of cotton produced is increasing.

Notwithstanding the data above set forth upon the continual and fairly rapid development of the production of cotton within the limits of Russia, the time is still far distant when Russian cotton-spinning mills and weaving-sheds will manufacture exclusively Russian cotton. The supply of the Russian markets with cotton from Central Asia and Transcaucasia, lately largely increased, is far from being sufficient to satisfy the continually growing demand, and the quantity of cotton imported is diminishing very slowly, if any. The amount of cotton brought into Russia from abroad is expressed by the following figures covering the last few years:

Years.	Pounds.	Roubles.	Years.	Pounds.	Roubles.
1882 . . .	7,068,649	74,053,000	1887 . . .	10,776,829	101,562,000
1883 . . .	8,359,311	95,086,000	1888 . . .	7,958,447	75,723,000
1884 . . .	6,786,817	78,623,000	1889 . . .	10,087,581	93,763,000
1885 . . .	6,937,872	68,511,000	1890 . . .	8,566,067	81,497,000
1886 . . .	7,528,969	73,016,000	1891 . . .	9,776,090	72,753,000

Thus on the average for the last ten years there were imported annually some 8,180,000 pounds valued at about 81,400,000 roubles. By far the greatest quantity of cotton employed in Russia is imported by the European frontier, mainly from the United States, Great Britain, Germany and Egypt. The former and latter countries send their own cotton; Germany and Great Britain send partly American cotton from the United States and Brazil, partly Indian, and perhaps Egyptian.

The participation of these countries in providing Russia with cotton during the last five years is shown in the following table:

Import of Cotton in pounds.					
	1887.	1888.	1889.	1890.	1891.
United States. . . . .	4,120,087	1,886,407	4,868,734	5,048,107	3,798,597
Great Britain. . . . .	2,484,059	1,891,442	1,602,191	696,072	655,495
Germany. . . . .	1,463,307	1,273,304	920,357	713,316	676,326
Egypt . . . . .	1,006,654	1,187,204	932,869	1,105,198	1,798,597

Accordingly the largest quantity of cotton received by Russia comes from the United States and Egypt, that is, from cotton-producing countries, and only a small amount, second and third hand, from Germany and Great Britain. Among the Asiatic countries supplying Russia with cotton, besides Bokhara and Khiva mentioned above, Persia takes an important place, having exported in 1890 to Russia 413,874 pounds; in the same year China sent 2,639 pounds. Besides that which is brought from abroad, Russia, as shown, uses a considerable quantity of her own cotton, grown in Turkestan, Transcaucasia, Transcapia, Bokhara and Khiva. The total quantity made use of at present amounts to nearly 10,500,000 pounds.

#### SUNFLOWER.

The Sunflower (*helianthus annuus* L.) belongs to the order of compositae; its home is Peru and Mexico, whence it was brought to Europe by the Spaniards already in the beginning of the sixteenth century.

To the same period must be referred the earliest attempts at growing it, at first in Spain and afterwards in France and other neighbouring countries. At the present time this plant, thanks to its handsome growth, is met with, even if in inconsiderable quantities, in almost all the countries of Europe. In Russia the seeds of the sunflower, resembling in taste cedar nuts, have found a special and more practical application. In the first place they afford a cheap dainty for the people, who husk and eat them as a nut, for which purpose the plant has been chiefly grown in the government of Saratov. Beginning, however, with the thirties, when the peasant Bokarev discovered the large quantity of oil contained in the seeds, the cultivation of the sunflower has been carried on as an oil-yielding plant, producing a whole series of valuable products.

For the successful growing in Europe of sunflower is required, besides the favourable composition of the soil in respect to its mineral constituents, the presence of the same climatic conditions enjoyed by it in the countries of its origin. Assimilating as it does during the period of its growth a large quantity of potash the sunflower requires a deep, rich and warm soil. The best crops are obtained upon light Chernoziom, low-lying and moderately damp but not flooded soils. Its seeds ripen completely only in the southern and south-eastern zones of Russia, to wit, the governments of Voronezh, Saratov, Tambov, Kursk, Kherson, Kharkov, Samara, Poltava and Ekaterinoslav, in the territory of the Don, and in the Caucasus.

The sunflower does not require fresh manure. Such a dressing is even injurious to it, hurrying the growth too much at the cost of the filling of the seed, and hence in the rotation of crops it should never occupy the first place. As a general rule it is sown in the second year after manuring, or upon beds following cucumbers and watermelons. After sunflower, which cleans the soil from weeds, wheat, and indeed all the cereals not requiring a large amount of potash, grow excellently. The sowing of sunflower upon the same spot for more than two years running, or returning to the same crop earlier than after four years, exhausts the soil to such an extent that the yield does not repay even the expenses of cultivation. Sunflower may be sown with almost equal advantage in spring or late autumn, with a row-drill upon a harrowed field, in the furrows under the common Russian plough, *sokha*, or broadcast. In the more northern zone when, on account of the shortness of the summer, the seed sometimes does not ripen, the planting of seedlings is practised to save time, a method which, however, involves much extra trouble. The shoots from the sunflower seed usually appear from five to ten days after sowing; when they attain a height of four vershoks, they are thinned and weeded, and the soil around them is loosened; when they have grown from seven to eight vershoks, a high bank of mould is heaped against the stalk. In the opinion of experienced growers, this hilling plays an important part in the amount of the future crop. When the plants are an arshire high, the side branches are cut off to encourage the growth of the heads and the filling of the seed. The sunflower when ripe is cut down with a hook, and after drying on the field in order to facilitate the separation of the seeds from the heads, is gathered and hauled to the thrashing-floors where it is thrashed; that which is destined for the production of oil is thrashed with flails, that which is to be eaten as a nut, with sticks, the heads being placed in several rows one upon another to avoid damage to the hulls of the seed.

The discovery in the seeds of the valuable properties of an oil-yielding plant, resulted, as its immediate consequence, in the extremely rapid increase in the area of its production

not merely in the centre of its cultivation, the government of Voronezh, but in the neighbouring governments. At the same time the manufacture of oil as a domestic industry was followed by the building of mills. The development of the production and treatment of the sunflower has not ceased to the present moment. According to existing data the area under sunflower, which in 1880 and 1881 was equal to 136,355 dessiatines in 1886, and in 1887 had attained 261,294 dessiatines, an increase of 98·3 per cent. The principal governments occupied with the growing of sunflower, with the extent of its cultivation in them, in 1886 and 1887 may be indicated as follows: Varonezh, 100,963 dessiatines; Saratov, 83,860 dessiatines; Tambov, 24,557 dessiatines; Kursk, 15,143 dessiatines; Samara, 9,510 dessiatines; Don Territory, 5,452 dessiatines; Kharkov, 5,225 dessiatines, and Poltava, 4,767 dessiatines. Of the 261,294 dessiatines occupied by this crop in 1886 and 1887, 151,352 dessiatines were on peasant lands and 109,942 dessiatines on those of landholders.

The highest average yield is observed in the governments of Kursk, Voronezh, Tambov and Poltava, where the peasants collect 45 to 53 pouds per dessiatine, and the landholders 56 to 63 pouds, the best crops being taken from new lands. In the Voronezh government, for example, in some years 120 to 150 and even 160 pouds of oil seed were gathered from such lands, while the average product is only 64 pouds to the dessiatine. The following were the total yields of sunflower seed in the different governments for 1888: Saratov, 424,818 chetverts; Voronezh, 251,618 chetverts; Tambov, 64,464; Kursk, 41,883; in the Territory of the Don Cossacks, 37,755; Samara, 31,193; Poltava, 15,958, and in the remaining Chernoziom governments, 44,001, or a total of 911,688 chetverts.

With regularly conducted cultivation, with the avoidance of continual sowing on one and the same spot, and with a choice of good seed, the sunflower must, on account of the quantity of valuable products obtained from it, be reckoned among the most profitable crops of the farmer. The increase of its cultivation on the peasant farms is therefore desirable. Together with the enlargement of the area of cultivation of the sunflower there, the oil-pressing industry based upon it also grew, the number of special mills increasing considerably. On the basis of data furnished by the Department of Trade and Manufacture the numbers of mills in operation were in 1889 as follows, for the different governments: in Voronezh, 40; Saratov, 49; Kuban Territory, 6; in Kursk, 3; Tambov, 4; Kharkov, 4; Oriol and Samara and in the territory of Semiretchensk, 1 each; in all, 109. Thus more than 80 per cent of all the mills are concentrated in the governments of Voronezh and Saratov. For the period of four years from 1884 to 1889 the total number of mills increased by 20·3 per cent, the quantity of oil extracted, by 400,580 pouds or 197 per cent, and the value of the production increased from 1,122,000 roubles in 1884 and 1885, to 2,188,700 roubles in 1889, that is, by 1,066,700 roubles or 94·9 per cent. On the whole the peculiarity must be observed in the sunflower oil-pressing industry, that in consequence of the limited area occupied by the cultivation of this plant, the harvest has an immense effect upon the increase or decrease of the number of mills, especially the smaller, which receive the raw material from year to year from the same district. Further, work in the sunflower oil mills does not continue during the course of the whole year, but lasts only five, six or, at the most, seven months. Usually even the large mills of the Saratov government begin working in September or October and continue only till March, April, or at the latest, May, after which they stop and the workmen are discharged till the autumn.

The prices for sunflower seed are on the constant decline. Thus for example, in 1883 a poud of laden sunflower was worth in Saratov, 1·74 roubles, while in 1889 it had fallen to 1·02 roubles; oil sunflower brought in Saratov in 1883, 1·54 roubles, and in 1889 92 kopecks. Sunflower oil in like manner has fallen considerably in value; during the last seven years it has cheapened almost half. In 1883 in Saratov one poud cost 8·38 roubles with fluctuations between 6·90 and 9·40 roubles, while in 1889 it cheapened to 4·06 roubles with fluctuations from 3·60 to 4·40 roubles.

The whole of the sunflower oil produced, with but insignificant exceptions, finds a sale in the home markets. The export is inconsiderable and irregular. But if sunflower seed and oil find a sale at home, sunflower residues, on the other hand, have a large demand on the foreign markets, as an excellent food for cattle and fowls. The quantity of residues exported increases every year as appears from the following data: in 1875 the export of all kinds of residues was 1,103,000 pouds, valued at 819,000 roubles; in 1880, 1,694,837 pouds, valued at 1,761,085 roubles. In 1889 the export of sunflower residues alone was equal to 2,434,000 pouds valued at 1,637,000 roubles; in 1890, 1,969,359 pouds, valued at 1,379,856 roubles; in 1891, 2,522,000 pouds, valued at 1,852,000 roubles, which formed in 1889, 27·7 per cent, in 1890, 24·6 per cent, in 1891, 24·8 per cent of the total export of all kinds of residues. The use of the stalks and husks as fuel is a great help to the industry, especially if account be taken of the almost total absence of forest in the southern governments. According to an approximate calculation the amount of husks obtained form 10 per cent of the total quantity of the seed, employed in the production of oil, that part which is not used for fuel in the mill being sold at two and a half kopecks per mera. Besides husks and stalks the heads also go as fuel. On the whole the sunflower is an extremely useful plant and a valuable aid in the rural economy of the south-eastern zone of Russia especially in the years of scarcity in the cereal crops.

#### R A P E S E E D, S U R E P K A A N D R E P A K.

Under the names of raps (rape seed), surepka (wild mustard) and repak several species and varieties of oil-yielding plants belonging to the order of cruciferae are cultivated in Russia. These plants are frequently confounded by farmers, who in different localities give to one and the same plant different names, or on the contrary grow under one and the same name distinct plants.

The raps proper (*brassica napus L. oleifera*) cultivated in western Europe is sown both as a winter and as a spring crop only in the Vistula governments, here and there in the south-western, and in a few places in the southern governments, in the latter to a very small extent. Surepka (*brassica rapa L. campestris*), and *rapa L. var. oleifera biennis*, grown in Germany under the name of Rübsen and in France under that of navette d'été, enjoys a much wider distribution. Russian farmers give the surepka other names also, as raps and repak. Thus under the first name, as also under that of surepka, it is known in the central and eastern governments, while in the south-western and south southern Russian ports it is called surepka and repak. This plant is chiefly cultivated in the form of the spring variety.

Under the name of surepka as many as three varieties of the plant, field-

mustard (*sinapis arvensis*), are grown in certain localities in the governments of Bessarabia, Ekaterinoslav and Poltava. This plant is entirely unknown to the field culture of western Europe, but grows in the west and in Russia in the wild state forming one of the most widely spread weeds occurring in spring crops.

All the above enumerated plants are grown chiefly on the farms of the landholders. The peasants sow them in insignificant quantities. Thus, according to the information collected by the Central Statistical Committee in 1881, in the total for the fifty governments of European Russia, exclusive of the Vistula governments, out of 100 dessiatines of sown fields, there was upon the landholders lands 0·74, and upon those of the peasants 0·03 dessiatine of raps and surepka.

According to the same data the total quantity of land under raps and surepka was as follows, in dessiatines:

Tambov . . . . .	1,321	Podolsk . . . . .	10,703
Voronezh . . . . .	1,814	Volynia . . . . .	5,065
Penza . . . . .	2,208	Kherson . . . . .	58,116
Saratov . . . . .	3,134	Bessarabia . . . . .	4,097
Poltava. . . . .	15,036	Ekaterinoslav . . . .	3,777
Kiev. . . . .	20,517	Viatka . . . . .	1,429

Thus the total area under raps and surepka in the above named governments was 127,217 dessiatines, of which 115,591 were on lands of the landholders and 11,626 dessiatines on those of the peasants. In the remaining governments the extent of the areas under these plants is insignificant and does not exceed a few hundred dessiatines.

It must however be observed that in the course of the last decade, judging by the information periodically supplied by the farmers to the Department of Agriculture and Rural Industry, the area under raps and surepka has apparently increased and still increases in consequence of the continued good demand for the seed, its easy sale and comparatively good prices.

With reference to the crops, the averages for ten years according to the data of the Department of Agriculture are expressed in pouds per state dessiatines in the following table:

G o v e r n m e n t s .	Winter raps.		Spring raps.		Surepka, repak.	
	Ave- rage.	Fluctua- tions.	Ave- rage.	Fluctua- tions.	Ave- rage.	Fluctua- tions.
Tambov . . . . .	—	52	33·2	10—43	—	8—47
Voronezh. . . . .	—	—	37·7	10—47	—	35
Penza . . . . .	—	—	—	—	30·3	18—44
Saratov . . . . .	—	81	—	37	34·4	13—50
Poltava. . . . .	50·4	30— 75	42·1	30—58	—	38—80
Kiev. . . . .	51·2	16—102	—	17—70	—	—
Podolsk . . . . .	63·4	20— 90	—	22—43	—	60
Volynsk . . . . .	52·5	26— 85	—	28—50	—	—
Bessarabia . . . . .	89·6	65—110	—	—	—	—
Kherson . . . . .	47·8	20— 65	29·2	7½—55	—	30—57
Ekaterinoslav. . . .	—	—	—	—	—	21—38

Raps, repak and surepka are exported in considerable quantities; thus in the course of the last five years the export was as follows:

Years.	Pounds.	Roubles.
In 1887 . . . . .	6,287,260	5,945,628
» 1888 . . . . .	4,494,204	4,958,476
» 1889 . . . . .	4,369,788	5,235,349
» 1890 . . . . .	7,134,943	9,855,948
» 1891 . . . . .	5,776,273	5,991,274

The chief role in the export of the seeds of the plants in question is played by the south-Russian ports, Odessa, Rostov on Don, and Nicolaev. Through Odessa alone there were exported in 1887, 1,735,668 pounds, or 27·6 per cent of the total export; in 1888, 1,765,673 pounds or 39·3 per cent; in 1889, 502,905 or 11·6 per cent; in 1890, 3,300,541 pounds or 46·2 per cent; in 1891, 2,034,226 pounds or 35·2 per cent. The chief sale was in Great Britain, next in Germany, Belgium, Holland, and other countries. Thus, the export and its percentage relation to the total, for Great Britain and Germany, was as follows:

Year.	Great Britain.		Germany.	
	Pounds.	Per cent.	Pounds.	Per cent.
1887	4,298,356	68·3	1,182,134	18·8
1888	3,006,397	66·9	484,654	10·8
1889	3,040,875	69·6	644,147	14·7
1890	2,678,842	37·5	1,543,577	21·3
1891	2,873,006	49·7	1,169,136	20·2

The prices for rape seed were latterly as follows: in Riga, a poud brought in 1888 on an average 1·70 roubles; in 1889, 1·79; in 1890, 1·32; in the same year in Voronezh a poud sold on an average for 91·5 kopecks. Surepka oil sold in Borissoglebsk in 1888 from 50 to 75 kopecks and in 1889, from 45 to 60 kopecks: for the same years in Rostov on Don a chetvert brought from 6·89 to 7·34 roubles.

As for the oils obtained from surepka and raps, it is difficult to judge of the quantity exported, seeing that according to existing data it is impossible to separate them from the other vegetable oils. For the last few years vegetable oils, excluding hemp, linseed and mustard, were exported in the following amounts:

In 1887 . . . . .	28,865	pounds, valued at 249,475 roubles.
» 1888 . . . . .	43,485	»     » 317,146     »
» 1889 . . . . .	41,878	»     » 275,656     »
» 1890 . . . . .	37,089	»     » 256,618     »
» 1891 . . . . .	37,303	»     » 276,099     »

#### M U S T A R D.

Black or yellow mustard (*sinapis juncea* L.), is cultivated in Russia in order to obtain from its seeds oil and table mustard. As centres of the culture must be considered the neighbourhoods of the German Colony of Sarepta in the southern part

of the Tsaritsyn district of the Saratov government, where it was first sown and whence it has spread to the adjacent localities.

At the present time mustard is grown, besides the southern part of the Tsaritsyn district, in the Chernoyarsk and Tsarevsk districts of the Astrakhan government, in the second Don district of the territory, and in certain other localities of southern Russia.

Mustard, not a very capricious plant, stands heat and drought excellently, yields pretty regular crops and it not exposed to the attacks of marmots, (*suslik*s), and consequently is endowed with qualities of the greatest value in the south-east and south of Russia; it thrives best on clayey soils. The culture of mustard in Russia was introduced in the latter years of the last century due to the interest of the Imperial Free Economic Society for the spreading of new plants, for which purpose these seeds were sent to various places with the necessary instructions. The first sowing of mustard was from seeds obtained in this way by the colonist Neuz in Sarepta about the year 1799. The experiment was successful, and mustard was cultivated in the fields. Neuz also constructed the first hand oil-pressing apparatus, and during a considerable time the oil industry was only in his hands and was of very small proportions. Neuz's successor applied horsepower; the industry somewhat enlarged and in the thirties he made use of about 15,000 pouds of raw material. In the middle of the forties there were built three new oil mills in Sarepta and Dubovka by various persons from among the Colonists. In 1850 came the first steam mill in consequence of which the production considerably increased. In 1864, a second steam mill was brought into operation also in Sarepta, in 1870, two more steam mills in Dubovka, in 1884, others arose in Dubovka, Tsaritsyn and Sarepta, and finally, in 1888, a new mill was built in Tsaritsyn. Two of the enumerated mills quickly closed and accordingly in 1892 there were in operation six steam oil mills and over and above these, about 20 small mills in the various villages.

The increase in the number of mills augmented the cultivation of mustard and the constant good demand for it. In recent years the price per poud of mustard seed fluctuated between 1 and 1·70 roubles. Of the raw material the six steam mills manufacture about 250,000 to 50,002 pouds of seed, producing from 50,000 to 55,000 pouds of oil and 100,000 to 110,000 pouds of table mustard of all sorts. Including the small mills it may be assumed that the annual manufacture employs about 300,000 pouds of mustard seed. The products obtained are almost entirely used in the country itself not serving as an article of export in any considerable extent.

#### GARDEN CRESS, RYZHIK.

Garden-cress, called *ryzhei* or *ryzhik* (*camelina sativa* Crantz, *myagrum sativum* L.) of the order of *cruciferae*, is grown for the oil obtained from its seeds and which is employed as food. This plant is grown in many governments of the Chernoziom zone of Russia, but in extremely limited quantities. The largest area devoted to its cultivation is in the governments of Poltava, Chernigov, Kiev, Kherson, Ekaterinoslav, and Kursk. It must be observed that in the course of the last decade garden cress has been continually gaining more importance in farming in consequence of its freedom from caprice in respect of soil, its hardiness with regard to unfavourable meteorological conditions, its constant crops, and the good demand for it on the foreign markets. Some farmers point out as a defect of garden cress, the great

exhaustion of the soil produced by it. The seeds are sown in the spring broadcast or in rows, and as early as possible. In the first case 40 to 50 pounds of seed go to the state dessiatine, in the latter from 30 to 40 pounds. The care necessary during the period of growth, continuing from 12 to 16 weeks consists in the removal of weeds and hoeing. The harvesting is done with a sickle or sometimes by plucking. The thrashing is by means of flails, or the machine, garmen, worked by horses, very rarely and only among landholders, by thrashers.

Among insects garden cress has a few enemies. The chief of these are the *haltica oleracea* L., *entomoscelis adonidis* Pall, and *plusia gamma* L., which devour its leaves.

The yield from a state dessiatine sometimes reaches 100 pouds, but as a rule does not exceed 40 to 60. The following were the averages for different governments for the last ten years, according to the Department of Agriculture and Rural Industry.

Governments.	Average.	Fluctuations.
	P o u d s.	
Poltava . . . . .	44	30—55
Kiev . . . . .	—	45—60
Kherson. . . . .	33·5	15—45

The local prices for a poud of seed in the course of the last few years stood at about one rouble. Thus in the Poltava government in 1889 it brought from 60 kopecks to one rouble; in 1891, one rouble; in the Kharkov government in 1889 a poud of garden cress seed was worth 1 to 1·20 roubles, and in the same year in the Kursk government it sold for 1·15 rouble.

### P O P P Y.

The poppy (*papaver somniferum* L.) of the order of *papaveraceae*, is grown in Russia mainly for obtaining from its seeds oil of a very excellent quality, employed as food, but also for export. Besides this, poppy seed is used in the country for the preparation of different dainties and as an addition to various dishes. Several varieties of poppy are grown: first, the so-called white poppy, with flowers bright red, completely white, or white with red at the base of the petals; the seeds of this variety are white and enclosed in a vessel which does not open; the second variety, the ordinary blind poppy, has blood-red or lilac flowers with dark patches at the base of the petals; the seed vessel is also not dehiscent, the seeds are gray or gray blue in colour; thirdly, the scattering poppy, which received its name from the circumstance that on ripening there appear in the vessel on the upper surface apertures through which the gray or gray blue seeds are easily spilled; its flowers are whitish with dark lilac patches at the base. Most widely spread are the two latter sorts on account of the superior taste of the seeds, and especially the second variety which presents less danger of their being spilled. In the white poppy the seeds are somewhat bitter and besides this the plant is very exacting in respect to soil, suffers more than the others from rains occurring during harvesting, and finally its sale is less assured

and attended with greater difficulties, as although it is valued more highly it is demanded in smaller quantities than the gray, and blue or black poppy. Poppy is cultivated over nearly the whole of Russia but in limited quantities, often only as a kitchen garden plant. It occurs in field culture only in a few governments chiefly in Little Russia and the south-west, mainly in Kiev and in the governments of Voronezh, Saratov, Kursk and Tambov.

The period of growth of the poppy is from 18 to 20 weeks. It is not particularly sensitive to the spring morning frosts which occur during the appearance of the shoots and the first period of its growth. As however it further develops, and particularly during the filling of the grain, it requires warm and sunny weather. Prolonged droughts have an injurious effect upon it, powerfully lowering the extent of the yield. In respect to soil the most suitable for the cultivation of poppy is that which is of average friability, clayey or sandy, fertile, free from weeds and well tilled to a depth of 7 to 8 inches. It thrives best upon fresh lands, obtained from virgin soil, long fallow or forest, in spots sheltered from cold dry winds. In field culture the poppy is classed among the spring crops.

The season of poppy sowing is dependent upon the climate, but everywhere it is as early as possible. In some places it is sown late in autumn during the first fall of snow, or even in winter on the snow, but only when it is reasonably certain that it will not sprout before spring. Generally it is sown in spring after the snow has melted. In sowing, the seed is sometimes scattered broadcast over the field, and sometimes in rows, the latter being the more prevalent; when sown in rows the drill is occasionally used but generally the seeds are scattered by hand in furrows especially prepared. In the broadcast method about eighteen pounds of poppy seed are sown per dessiatine, and when in rows, from eight to fourteen pounds; in some instances, however, from 30 to 40 pounds are used per dessiatine. The seed is then covered with the aid of a harrow or a dragnet. During its growth it is necessary to weed the field and take out the superfluous sprouts of poppy till there is a distance of five to eight vershoks between each stalk; usually the crop is weeded and pruned three times during the season.

Poppy is harvested in different ways: sometimes the crop is pulled, and sometimes only the heads are cut off, as they ripen. When the heads are dry they are thrashed, generally with the flail, the thrashing floor being covered with a cloth. Thrashing machines are used only on rich estates and that not universally.

Of all the enemies which attack the poppy, the most dangerous is the white-spotted insect, *ceutorhynchus macula alba*, which has a hidden proboscis. The female of this insect pierces the poppy heads before they are fully developed and then lays her eggs within; the larvae, as soon as they appear, feed upon the unripe seed.

The crop is very irregular and fluctuates from 10 to 100 pouds per dessiatine, the latter figures being considered very satisfactory in the government of Kiev; the average crops is from 30 to 40 pouds.

According to the information given by the Department of Agriculture and Rural Economy, the average poppy crop in the different governments during the last ten years, expressed in pouds per dessiatine, is tabulated as follows:

Governments.	Average.	Fluctuations.
Chernigov . . . . .	—	20—45
Kursk . . . . .	35	10—65
Poltava . . . . .	30·5	10—50
Kiev . . . . .	35	25—45
Tambov . . . . .	26·2	10—45
Volyn . . . . .	—	30—50
Voronezh . . . . .	25·5	10—50
Saratov . . . . .	33·2	10—65
Penza . . . . .	30	15—50

There are no fixed data for showing the cost of poppy cultivation in the different localities, although according to some calculations it costs, excluding the rent paid for the ground, from 45 to 50 roubles in the south-western countries, and from 35 to 40 roubles in the central governments; so that a poud of poppy seed costs the producer from 90 kopecks to 1·35 roubles when the harvest gives 35 to 40 pouds per dessiatine. These figures, of course, fluctuate according to the harvest. The prices of poppy seed have ranged lately from 1·20 to 2·60 roubles per poud on the spot; in the government of Tambov in 1889 the price was 1·60 roubles, and in the government of Volyn in 1891, 2·60 roubles. The average price for poppy seed can be considered from 1·80 to 2 roubles on the spot. From 1889 to 1891 the prices at one of the principal markets in Tambov were as follows:

In 1889 average price 1·99 roubles, fluctuating from 1·40 to 2·40 roubles.
» 1890      »      1·69      »      »      » 1·20      » 2·40      »
» 1891      »      2·57      »      »      » 2·20      » 3·20      »

The prices of poppy oil were, in 1890, 3·98 roubles per poud, fluctuating from 3·40 to 4·50 roubles; in 1891, 5·23 roubles, 4·40 to 5·90 roubles.

It is impossible to define the quantity of poppy sent abroad, as it is only exported together with other oil seeds, and is therefore not registered separately.

#### T O B A C C O.

The cultivation of tobacco is one of the special branches of agriculture the most widespread in Russia. It is grown in more than 50 governments of the Empire, but only in some regions has it attained a considerable development and trade importance. The magnitude of the plantations and the quantity of tobacco harvested vary greatly from year to year. These fluctuations depend principally upon the market prices of tobacco and upon the meteorological conditions of the season influencing the tobacco crop. Thus from 1882 to 1891 tobacco plantations occupied an area ranging from 38,080 dessiatines in 1889, to 59,090 dessiatines in 1886. In 1891 the area under tobacco was 46,794 dessiatines; the smallest harvest was in 1884, when only 2,309,241 pouds were harvested, and the greatest in 1887 when 3,388,975 pouds were gathered.

The development of tobacco cultivation in the different regions of the Empire may be seen from the following table which shows the average data of areas under tobacco and the quantity harvested from 1886 to 1890.

Regions.	Dessiatines.	Pounds.	Per cents.
Central Chernoziom . . . . .	10,874	989,437	23·27
Northern . . . . .	18,275·6	1,889,116	44·43
Southern steppe . . . . .	7,175	297,497	7·00
Caucasus . . . . .	9,699·3	652,037·5	15·33
Other parts of Russia . . . . .	5,309·5	424,258·7	9·97
Total. . .	51,333·4	4,252,346·2	100

From these figures it may be seen that the greatest quantity of tobacco is produced in the north-Chernoziom region, where on the average about 45 per cent of the total product in Russia is harvested. The largest areas under tobacco are also in the north-Chernoziom regions; next are the central-Chernoziom governments, both in area and in the quantity of tobacco gathered, being on the average about 28 per cent of the total crop. Then come Transcaucasia and the north-Caucasus, and lastly, the southern steppe governments. These four regions have a well developed tobacco industry. In the remainder of the vast agricultural area of Russia, including the non-Chernoziom regions, Siberia, Middle Asiatic regions, the south-western, eastern and south-eastern governments, the tobacco crops forms 10 per cent of the total harvest.

In the four above mentioned regions tobacco cultivation is not evenly distributed. Thus, in the northern Chernoziom region which consists of the governments of Kursk, Chernigov, Oriol, Tambov, Tula, Riazan and Penza, it is principally centralized in the government of Chernigov, where from 1886 to 1890, on the average, 13,656 dessiatines were yearly under tobacco, and 1,329,149 pounds, or 70 per cent of the total crop of that entire tobacco region, were harvested.

In the central Chernoziom region tobacco cultivation has principally developed itself in the government of Poltava, which had during the same years 9,358 dessiatines under tobacco, and harvested 835,483 pounds, or 70 per cent of the total crop of that tobacco region.

In the southern steppe region the predominant government for tobacco culture is Tauride, which had from 1886 to 1890 a yearly average of 3,411 dessiatines under tobacco, and harvested 188,000 pounds, more than 63 per cent of the total tobacco harvest of that entire region. Among the governments and districts of the Caucasus tobacco is the most cultivated in the Kubansk district which had during the above-mentioned years 6,840 dessiatines under cultivation, and harvested 485,000 pounds, or 75 per cent of the total tobacco harvest in the Caucasus. From the foregoing it may be seen that tobacco cultivation is, properly speaking, concentrated in three governments: Chernigov, Poltava and Tauride, and in the Kubansk district. In these four provinces there are 33,265 dessiatines under tobacco; of the 51,333 dessiatines of tobacco plantations in the whole of Russia this area would be nearly two-thirds, and the crop 2,837,622 pounds, would be about 70 per cent of the total harvest in Russia. In addition to the above-named governments Bessarabia is also noted for its tobacco. Ten to fifteen years ago this government occupied one of the first ranks in this industry, but lately it has yielded to the government of Tauride and the Caucasus; the latter has only recently begun to grow tobacco to such a great extent. Next must be also mentioned the governments of Voronezh and Tambov, which are developing their tobacco industry and are now competing with the governments of Chernigov and Poltava. Lastly there are localities of

the Samara government where tobacco has been raised from ancient times, and where the crop is now concentrated in the German colonies.

The quantity of tobacco produced in Russia not only supplies the home demands but is also exported. Thus in 1889, 291,279 pouds of leaf tobacco, snuff, cigars and cigarettes, to the sum of 610,000 roubles were exported; and in 1890, 204,328 pouds of leaf tobacco and other tobacco manufactures, to the amount of 840,000 roubles. At the same time Russia imports, however, a certain quantity of leaf tobacco and tobacco manufactures, especially cigars. In 1889 Russia imported 71,174 pouds of leaf tobacco and 550,000 roubles worth of tobacco in other forms, and in 1890, 91,371 pouds of leaf tobacco and 584,000 roubles worth of tobacco goods. It must be observed, however, that tobacco import, especially of the leaf, has considerably decreased, in comparison with 1870, when it attained 250,000 pouds.

Foreign tobacco is imported, because Russia does not produce the high grades, such as the Turkish *dubek* and *shvar*, or the American cigar tobacco. Thus to satisfy the most exacting consumer, crumbed tobacco of the highest sort and the best cigars are either brought direct from abroad, or prepared in the Russian manufactories of foreign tobacco. Besides, a great part of the imported tobacco, such as the Turkish *shvara*, is used in the Russian fabrics for ameliorating the home product, in preparing the medium sorts; from 5 to 10 per cent of the aromatic foreign growth is then added to the local. Russia exports leaf tobacco principally of low quality. One may judge of the quality of the imported and exported tobacco by their average prices, the first being 33 roubles and the latter 4 roubles per poud.

Russia cultivates two sorts of tobacco: *nicotiana tabacum* and *nicotiana rustica*. These two kinds differ from each other in botanical relations such as the form and disposition of the leaves, and the form and especially the colour of the corolla. The first *nicotiana tabacum* has the corolla of a red pink colour of all shades, from light pink to purple red; the second, *nicotiana rustica*, has a yellow corolla also in some degree of different shades. Both of these two sorts cultivated in Russia have many different species which possess different agriculture and technical qualities. But first it must be observed, that all the species of the first sort are of higher quality and used for making cigars and crumbed tobacco for cigarettes, and in general for fulfilling the demands of the higher classes. The second sort is of poorer quality, and is used by the lower classes for smoking either in pipe, now going out of fashion, or in cigarettes rolled in common paper, sometimes even in old newspapers. This low sort of tobacco, called *makhorka*, is sometimes used for washing sheep, in order to clean them from scurf and scabs, as well as for destroying insects in gardening.

The cultivation of tobacco *nicotiana tabacum* came to Western Europe and then to Russia from America soon after the discovery of that country. As to the other sort, *nicotiana rustica*, there are reasons to suppose that it was known in the Old World and in Russia long before the discovery of America.

Tobacco of the highest grades are mostly cultivated in the south of European Russia, namely in the governments of Bessarabia and Tauride, and in the Caucasus. In the other parts of Russia it is met with very rarely, except in some districts of the government of Chernigov and some localities on the Volga in the government of Samara, where the black tobacco for cigars is grown in small areas. The most widespread tobacco of the high quality is the *trapezount*, cultivated in great quantities in the

Caucasus and in the south-eastern part of the Crimean peninsula; the American, cultivated over all the Tauride government, and the oungoushet, which is met with principally in Bessarabia and in the neighbouring localities of the government of Kherson. The Persichan, dubek and other aromatic and delicate varieties are cultivated very seldom in Russia and do not generally give a quality sufficiently high to rival the same tobacco cultivated in Asia Minor or in Macedonia. The above named species is a yellow tobacco, which is crumbed for the manufacture of cigarettes. Of cigar tobaccos the most widespread in the government of Chernigov is the goundi. The cigar tobacco cultivated in Russia, in the governments of Chernigov and Samara, gives a product of medium quality only. The aromatic and fine species of cigar tobacco are not cultivated in the least in Russia; but it is not to be said that such cultivation could not exist, as till now no serious trials have been made to introduce it in the localities where the soil and climate would seem to be favourable to its growth.

In the other parts of Russia the low grade, *nicotiana rustica*, is cultivated. Of this species the principal is the makhorka, which is called sometimes roubanka (chopped), as it is cut up together with the stem for use. Another variety of this species is called bakoun or shnourovka (corded), as the leaves, when cut off, are strung and then dried. This sort is seldom grown, and that only in some districts of the government of Chernigov.

The relative development in the cultivation of the higher and lower tobacco species in Russia can be seen from the following data, showing the harvest of different tobaccos from 1887 to 1891. During these years, 4,073,003 pouds of different sorts of tobacco were harvested in Russia; of these 944,512 ponds, or 23·2 per cent, was yellow high grade tobacco; 242,734 ponds, or 6 per cent, cigar tobacco, and 2,885,756 ponds or 70·8 per cent, low grade tobacco. From these figures it is seen to what a degree the low grades predominate over the higher in Russia.

There are many different ways of cultivating the plant in different localities due principally to the species of tobacco cultivated, to the climate, and finally to the different customs of the peasants. The methods of cultivating and working the high and the low grades of tobacco differ so much, as regards soil, fertilizing, nursing, harvesting and drying, that the two species must be examined as essentially different crops.

In general, the cultivation of the different species may be described as follows. The most fertile soil is chosen, and tobacco is grown on the same fields for many years. Tobacco fields are seldom changed to those of other crops. The field, where it is grown, bears the name of tobacco plantation. Small tobacco growers, who cultivate the plant only for their own use, sow it often in their gardens with cabbage and other vegetables. The tobacco plantations are of very different dimensions, ranging from 30 or 40 square sogenes to as many dessiatines. Small plantations often are met with, occupying less than one-quarter of a dessiatine; the area of middle size plantations is from one-quarter to two and three dessiatines. There are very few really large plantations and their number, as well as their dimensions, decreases from year to year. Tobacco cultivation in Russia is till now the work of small households and not of large planters. It is raised and manufactured, especially the low grades, by the families of the growers. Before the liberation of the serfs tobacco plantations were very profitable for estate owners, but since that date, as labour became dearer, the cultivation of vast plantations requiring a large number of hands,

was too expensive, and in consequence its cultivation has decreased rapidly, passing into the hands of small planters.

For the growing of the high grades of tobacco, virgin soil is used, such as fields fresh-cleared from forests, and in such soil tobacco is planted for many years in succession until the earth becomes quite exhausted, when other similar fields are chosen for its growth. Tobacco plantations are seldom fertilized, but if so then old, well scattered manure is used. The best way of fertilizing, and that most in use, is the irrigation method, as on the southern coast of the Crimea. Plantations thus fertilized remain the longest under tobacco crops. Owing to a great quantity of fertile soil from under primitive forests in the northern Caucasus, a great number of tobacco plantations have been organized lately in that country. On the contrary, in Bessarabia the number of such fertile fields has diminished, and hence the principal reason why tobacco culture has rapidly decreased there.

Tobacco of the lower sort is grown on fields lying in low river valleys, with a fertile slimy soil; on such fields a tobacco plantation stands during many decades, being well manured. When it is noticed that parasitic plants begin to develop themselves on the plantations, such as the *orobancheramosa*, or some disease befalls the tobacco, or it is beset by insects which injure the crop, then such a plantation is left to rest, and other produce is grown thereon, such as beans, cucumbers, hemp, and the like.

The soil for tobacco of both grades is cultivated in different ways, dependent upon the compactness of the earth, and also upon the habits of the planter. Compact soil, especially new ground, is ploughed twice or even three times, once in autumn and once or twice in spring; it is manured either in autumn, or spring. Soft soil or old plantations are ploughed only once in spring; after spring ploughing, the plantation is well harrowed and sometimes smoothed down with a roller.

Tobacco of high grade, and very often that of the lower, is produced in the following manner: first, tobacco seeds are sown, and when they sprout, the plants are transferred to the plantation. The seedlings are cultivated in hot houses filled with manure, or in beds which are covered for the night with mats, and sometimes simply in such parts of the plantations as are protected from cold winds. Grain of the lower grades of tobacco is sometimes sown in rows, 8 to 12 vershoks apart, and when the seedlings have 2 to 4 leaves, they are thinned out until the plants are from 6 to 8 vershoks apart.

Tobacco seedlings are planted in a line, or in prepared furrows, with the aid of a planting post. Sometimes a little water is poured into the hole in advance, and when the plant is placed, the earth around it is pressed down with the hand or the foot, and then more water added. But generally, if the earth is not too dry, it is only watered after the seedling has been planted. If the weather is dry, then the plants are moistened for several successive days, twice a day, morning and evening. They are watered thus till they have taken root. The withered plants are removed and others set in their places. The distance between the plants in the row and also between the rows is dependent upon the sort of tobacco grown, or rather upon the size of the leaves; the greater the leaves, the greater the distance apart. The greatest distance between the rows is 8 to 16 vershoks, and between the plants, 2 to 12 vershoks. When the plants are set in squares, then the distance between them may be smaller. Tobacco plantations are weeded, the surface of the soil is mellowed, and sometimes banked around the plant-

When high grade tobacco is cultivated, the planter lets the number of leaves have their full development, from 12 to 16 leaves on each stalk, and only when they are nearly ripe, are the flowers which are at the end of the stems plucked off. When makhorka is cultivated, the planter waits until it has grown from 4 to 8 leaves, when he cuts off the top of the stem, together with the flower buds and the young lateral branches. This pruning of young sprouts is called *pasynkovanie*. The less the leaves remain on the stem the stronger is the makhorka. The leaves are not taken off at once, but each leaf, as soon as it ripens is plucked separately, beginning from the lowest. Of the tobacco *bakoun* all the leaves are plucked at the same time. When makhorka *aroubanka* is harvested the whole of the stem is cut off, 2 to 3 vershocks from the root.

The drying and further working of the yellow tobacco of high sort are different, in some details, in various localities and sometimes even in various plantations of the same localities; but in general it is in the following manner. The leaves when harvested are put into closed barns in low layers and are covered with straw where they remain to sweat. When they are somewhat withered and have become dark-coloured they are strung with the aid of a metallic needle on a cord and hung in the sun to dry. Each cord is hung near the other so that the leaves continue to sweat. Sometimes fresh leaves are not subjected to the sweating process under cover in layers, and are strung on cords close together and hung in the sun to sweat. When the leaves hanging in the open air have dried to such a degree that their middle vein breaks, the cords with leaves are hung up vertically in sheds, sometimes at full length and sometimes double-folded. Thus the tobacco hangs until it is put into packets, which must be before the damp autumn weather sets in, lest the crop should mould. The leaves are sorted according to their quality, either before they are threaded or when they are bundled. In these packets, called *papousha*, the leaves are laid in such a manner that their tops lie one way and their stems the other; they are tied together at the stems with a common string. The number of leaves in a packet varies from 8 to 30, according to the locality and the quality. Generally the lower grades are put into larger packets than the higher. The most aromatic tobacco, such as *dubek*, is never put into packets but into larger packages, which are sewed up in linen. These bags weigh sometimes about one and one-half pouds. The packets of tobacco are piled up one on the other to the height of an arshine and are pressed under heavy weights. A fortnight later, and sometimes only in spring, they are joined into large piles from two to four pouds each. The packages of high grade tobacco weigh less than those of low grade. In Eessarabia these packages are sewed up in linen in such a manner that three sides are a little open. In Crimea and the Caucasus each package is tightly drawn together by means of a string and three pairs of sticks, and only in spring, after the tobacco has fermented, is it repacked, sewed up in linen and transported to the factories.

In March or April the packets begin to ferment and then they are placed at considerable distances apart. Only after it has fermented and has been repacked can tobacco be transported to great distances.

The drying and fermenting processes of black cigar tobacco differ from those of the yellow, in that the black tobacco is not dried in the sun nor in the open air, but in closed buildings, and ferments in large heaps, 100 to 300 pouds each. Packages of cigar tobacco, 3 to 4 pouds each, are sewed up in matting.

Tobacco *bakoun* is dried in two different ways, sometimes as the yellow sort,

sometimes as the black tobacco, and therefore it resembles sometimes the yellow and sometimes the black, though it is a little redder. Packages of *bakoun* weighing about 5 pouds each, are sewed up in matting.

*Makhorka* is dried in a quite different way. Of the harvest in the government of Samara only leaves are threaded on thin poles, called *glitsa*, and are hung up in special sheds or barns as near as possible one to another, and over all the barn from the floor to the roof. Thus the leaves dry and sweat, remaining dark green. In autumn when the leaves get a little damp they are taken off their stems and put into piles; formerly they were placed in *papousha*, but this custom has now fallen into disuse. When sent to market the leaves are put into sacks of five pouds each.

Tobacco harvests very considerably depend upon the qualities of the soil, the weather, upon the means of cultivation and other circumstances, such as injury by insects, diseases of the plantation and the like. The average harvest of yellow tobacco is about 60 pouds, fluctuating from twenty to one hundred pouds per dessiatine; of black cigar tobacco, 80 pouds, fluctuating from 40 to 120 pouds; of *makhorka* and *bakoun*, 100 pouds, varying from 50 to 150 and even 200 pouds. The prices for yellow tobacco fluctuate from 4 to 30 roubles per poud, dependent upon the quality and demand; for black, from 2 to 5 roubles per poud, and for *makhorka* and *bakoun* from 50 kopecks to 4 and 5 roubles per poud.

The Russian tobacco export and import trade can be seen from the following data:

Y e a r s .	Import of different sorts of tobacco and cigars into Russia.		Export of all sorts of tobacco except cigars and cigarettes.	
	Pouds.	Roubles.	Pouds.	Roubles.
1887	93,231	3,545,040	322,863	1,536,459
1888	44,238	1,588,577	315,990	1,494,162
1889	75,987	2,886,064	298,501	1,508,267
1890	99,271	3,732,086	214,989	1,663,694
1891	56,412	2,151,349	200,944	1,151,316

#### B E E T.

Beet culture, for obtaining sugar, has existed in Russia from the beginning of the present century. It came from Germany, and from the year 1800 lands were distributed free of cost in the southern regions of Russia to persons who wished to engage in this branch of agriculture. Prizes were appointed for such as had organized beet plantations and sugar refineries. However, beet culture for sugar developed at first very slowly; and in 1825 there were only seven refineries in existence. It is to be observed that even these seven were much further north than the region where beet is cultivated at the present time. The first refinery was organized by an estate owner by name Blankenagel, in the government of Tula; the next were in the governments of Moscow, Smolensk, Grodno and Nizhni-Novgorod. These refineries continued to exist, notwithstanding the unfavourable climate and soil for beet, and the bad quality of the crop. However, after the liberation of the serfs, when workmen had to be paid, beet culture became unprofitable

to the producers in the northern regions, and therefore, the sugar refineries were closed.

In the present centre of beet cultivation, the south-western regions, the first refinery was founded by Count Moshinski in 1827, in Bershad, government of Podolsk. In the government of Kiev, where at the present time exists the greatest number of refineries and where an extensive area is under beet, the first refinery was founded only in 1834. It was built by Count Leo Pototsky on his estate Orlovets. Soon afterwards two other refineries were established, one on the estate of Sitkovtsi by Count Yaroslav Pototsky and the other in Pochapintsi, on the estate of Chetvertikov. These attempts, however, did not succeed, and beet culture as well as the manufacture of beet sugar were at a standstill; when in 1840 Count Bobrinsky organized his refineries, one in Smela, district of Cherkassk, one in Yablonovka, same district, and one in Groushevka, district of Chigirine. The construction of these sugar refineries and the energy of Count Bobrinsky in trying to develop the beet industry had the desired effect. Beet fields began to develop greatly, first in the government of Kiev, Podolsk and Volynia, and then in the neighbouring governments and the borders of the Vistula.

Six years after the foundation of the refinery in Smela, 10,745 dessiatines were under beet in the government of Kiev. From this area 724,113 berkovets of beet were harvested, a dessiatine producing 67·5 berkovets. A berkovets of beet costs the producer 36 kopecks and thus the income amounted to 55 per cent of the capital. There were at that time 47 refineries, and the value of their production was 2,500,000 roubles, the price per poud of sugar being 6 roubles. As beet gives from 7·5 to 9·5 per cent of sugar, a berkovets of beet would produce about 18 pounds. In the campaign of 1846–7 there were 715,423 berkovets worked up in the factories, giving 276,966 pounds of sugar. Since then the cultivation of the beet has developed greatly and its area enlarged. In the government of Kiev in 1886, 81,679 dessiatines were under beet; in 1887, 66,035 dessiatines; in 1888, 69,888 dessiatines; in 1889, 68,382 dessiatines; and in 1890 80,363 dessiatines.

At the present time the sugar beet is cultivated in fourteen governments of the Chernoziom region, and in that of the Vistula. The principal governments for this industry are Kiev, Podolsk, Kharkov, Koursk and Warsaw.

According to data of 1883 the relation of the area occupied by beet to the general area of cultivated land in the principal centres of this crop may be represented as follows:

Governments.	D e s s i a t i n e s .			Per 100 dessiatines of ploughed land.		Per 100 dessiatines of beet sowings.
	Ploughed land.	Sowings.	Beet.	Sowings.	Beet.	
Kiev . . . . .	2,476,518	1,631,057	81,451	65·8	3·29	4·99
Podolsk . . . . .	2,313,147	1,510,310	55,658	65·2	2·40	3·62
Kharkov . . . . .	2,969,140	1,801,977	28,404	66·8	0·95	1·56
Kursk . . . . .	3,030,270	2,015,697	20,423	69·6	0·67	1·01
Volinia. . . . .	2,193,567	1,469,612	15,333	66·9	0·69	1·04

The following table shows the area under beet from 1886 to 1892:

General area of beet plantations.

Governments.	1886.	1887.	1888.	1889.	1890.	1891.	1892.				
	D	e	s	s	i	a	t	i	n	e	s.
Kiev . . . . .	81,679	66,035	69,888·8	68,382·3	80,363·5	74,891·5	66,535				
Podolsk . . . . .	55,772·5	45,879·5	50,502·5	51,556·75	56,602·8	56,547	58,115				
Kharkov . . . . .	32,572	29,415	29,081	29,102·5	33,833·8	38,746	32,758·5				
Kursk . . . . .	20,435	18,523	19,853	20,148	23,568	26,655	25,653				
Volynia . . . . .	14,879·5	13,895	14,986	14,843	16,535	14,944	14,698				
Voronezh . . . . .	5,746	5,614	6,026	7,310	8,117	7,997	6,976				
Tambov . . . . .	5,830	4,778	4,633	3,823·5	3,675·7	4,809	5,031·5				
Chernigov . . . . .	3,863	7,688	8,345	10,141	10,810	11,143	10,927				
Tula . . . . .	3,034	2,318	2,496	2,700	2,550	2,400	1,914				
Poltava . . . . .	2,618	2,148	2,516	2,317	2,360	2,366	2,182·5				
Samara . . . . .	1,650	1,205	2,008·8	2,145	2,352	2,293	1,495				
Ekaterinoslav . . . . .	1,570	1,400	1,400	1,505	1,020	—	—				
Bessarabia . . . . .	1,300	550	850	800	820	800	860				
Orel . . . . .	500	400	540	535	500	500	730				
Total . . . . .	234,449	199,848·5	213,126·1	214,809·05	243,107·8	244,092	227,875·5				
Warsaw . . . . .	19,817·25	16,873·5	18,013·9	18,414·25	20,068	20,665	19,834				
Kalish . . . . .	3,834·5	3,321·5	3,622	3,543·5	3,763	3,694	3,419·25				
Lublin . . . . .	2,941	2,092	2,188	2,082	2,203	2,536	3,198				
Plozk . . . . .	2,356·5	2,146	2,542	2,473	3,472	3,423	2,869				
Kelez . . . . .	2,119	2,049·5	1,980	2,259	1,980	1,969	2,050				
Radom . . . . .	1,700	1,765	1,420	1,418	1,347	1,437	1,340				
Sedlets . . . . .	1,406	1,301	1,108·5	937	1,263	1,056	1,053				
Petrokov . . . . .	1,341	887	974	945	1,025	1,150	1,300				
Lomzhin . . . . .	901	780	798	760	955	975	950				
Total . . . . .	36,416·5	31,215·5	32,646·4	32,831·75	36,076	36,895	36,013·25				
Grand total .	270,865·25	231,064	245,772·5	247,640·8	279,183·8	280,987	263,888·75				

Beet is cultivated by landowners as well as by peasants as near as possible to the refineries, as its transport in autumn, by reason of the bad condition of the roads, is very difficult and unprofitable. Generally the sugar factories obtain the necessary material partly from the estate on which they are situated and partly from the neighbouring peasants, with whom the manufacturer draws a contract engaging them to deliver a certain quantity of beets, буряків, to the refinery at a definite price agreed upon beforehand. In drawing the contract with peasants, the latter are given in many cases seeds for sowing, and sometimes, in order to obtain a better quality, a clause is inserted in the contract obliging them not to sow on freshly manured fields.

The species of beet cultivated in Russia vary greatly, and are all of foreign origin; they can be divided in two groups, French and German. To the first belong, white improved, вилморена, rose гатив, white and pink, Simon Legran;

these species are very popular. Of the German sorts the most used are the species grown by Knauer, namely the imperial, improved pink imperial, electoral, also those grown by Bestegorn, emperor and kleinwanzleben. The French varieties contain a great quantity of sugar, principal attention being devoted during their cultivation to the end of obtaining the greatest possible amount of saccharine matter, without regard to the size of the root, and consequently the rate of the harvest; whereas, in growing the German sorts a good harvest and good sugar substance are simultaneously held in view. In fact the numerous experiments with reference to the cultivation of the different species of sugar beet, in the governments of Kiev, Podolsk, Kharkov and Chernigov, demonstrate that the French group is of much higher quality than the German in technical respects, both as to the amount and the quality of sugar they contain, but that the German exceeds in the amount of the harvest, and in this respect the difference is very considerable. Thus, it appeared that the French varieties yielded, on an average, 93·3 berkovets per dessiatine, whereas the German yielded 114·7 berkovets, that is, 21 berkovets, or 22 per cent the more; sometimes this difference is even 35 per cent.

All the above-mentioned species, grown in countries with long and cool spring and summer wheather, in damp soil and air and not much exposed to sun, ripen very late, and when transported to Russia, where they enjoy a greater amount of warmth and light and comparatively less dampness, they lose their sugar qualities. Again, they partly become acclimatized, and partly degenerate, so that farmers in order to retain pure species, must often renew the seeds, and bring them from abroad, increasing thereby the expense and causing other difficulties. By this reason, beet cultivated in Russia, in the majority of cases, does not represent any strictly defined sort, but appears as a product of degeneration and acclimatization or crosses of various foreign species. It appears, however, that these admixtures are very satisfactory as to their technical qualities and amount of harvest, and gradually improve, because of the careful assortment of seeds practised on all the larger farms. As to the cultivation of local varieties of beet, notwithstanding their importance for Russian farmers, very little is done in this direction, and only in recent years have several such species appeared, namely: kalinovka, white, pink, and № 3, grown by Mr. Valkov in Vinnits district, government of Podolsk, the former being produced from the seeds of the villmorena, and the second, from those of the kleinwanzleben. The analysis made by Prof. Zaikevich showed that the kalinovka is but little excelled by the French species, and that it is much better than the German, especially than those cultivated for several years in Russia, as seen in the following data:

	Sugar.	Quality.	Technical quality.
French sorts . . .	17·25 per cent	87·56	15·10
Kalinovka " . . .	16·40 " "	87·25	14·31
German " . . .	14·71 " "	86·46	13·02

Other experiments of Knauer and Grossman in Germany show that the kalinovka excels other species in the amount of harvest, but is poorer in sugar qualities, as seen from the following table:

	Berkovets per dessiatine.	Sugar.	Quality.	Technical quality.
French sorts . . .	110	17·3 per cent	89·22	15·43
German " . . .	149·6	15·97 " "	89·10	14·23
Russia " . . .	157	14·86 " "	87·79	12·90

Finally a whole series of experiments, made by different persons in Russia as well as abroad, show that the beet grown by Mr. Valkov contains on an average 16·08 per cent of sugar in its juice, with fluctuations from 13·46 to 18·5 per cent, the quality being 86·28 with fluctuations between 81·0 and 90·2.

Besides *kalinovka*, seeds grown by Mr. Evstratiev in the government of Kiev are also known; the statistics show that they yield a better crop in quality than the species, *Simon Legran* or the imperial, as they contain from 13·16 to 15·65 per cent of sugar, the quality being 79·21 to 88·7 and the technical virtues 10·40 to 12·88.

The experiments above-mentioned prove that it is possible to cultivate in Russia good sorts of beet, not inferior to the foreign. In fact, in recent years on many farms, much attention has been paid to the cultivation of the seed, to its exterior appearance as well as to the specific gravity of the roots, which is determined by being immersed in a water solution of kitchen salt of a given density; all roots that sink in such a solution are used for further sowing; the work goes rapidly and gives excellent results.

The number of farms cultivating the seed increases, and Russian growers of beet find it possible to dispense with the necessity of bringing seeds from abroad, using instead the home-grown; in fact on some farms the beet seed is of such high quality that it is in demand on the foreign markets, and recently has been exported to a considerable extent.

In field culture, beet occupies different places in the rotation of crops; in the three-year rotation system it is generally sown after fallow; whereas in the alternation system it is placed in regular and various rotations of seed. Most frequently beet occupies the second place after the fertilizing of the field, the harvest not being satisfactory when sown directly after manuring because of the abundance of azote in the soil. The field after winter crops and fertilized under fallow by cattle manure is considered to be the best. Attention is called in Chapter IV of the present work, to the rotation of crops on estates, in which beet is cultivated. In places where grass-sowing is practised the following rotations of seed are met with, for example, in parts of the governments of Kharkov, Kursk, Kiev and Podolsk: 1. winter wheat after manure; 2. and 3. beet; 4. spring crop with grass; 5. and 7. grass, esparcet; or, 1. manured fallow; 2. rape seed; 3. winter wheat; 4. beet; 5. spring crop; 6. and 7. grass; 8. winter wheat; 9. beet (Yampolsk district, government of Podolsk); or 1. manured fallow; 2. half, rape seed, half, winter wheat; 3. half, winter wheat, half beet; 4. beet; 5. barley and oats with grass; 6. grass; 7. winter wheat; 8. beet; 9. spring crop (government of Podolsk); or 1. fallow; 2. winter crop; 3. and 4. beet; 5. spring crop, with grass; 6. and 8. grass; 9. and 10. beet (government of Kursk). Sometimes on the best farms, in the governments of Kiev, Kursk and Tambov, beet is preferably sown after fallow, fertilized with ashes, bone dust and animal manure, the reason being that there is too little time to cultivate the field, just cleared from winter crop, before the sowing of beet in spring; whereas, after fallow and after timely fertilizing there is yet sufficient time for the careful cultivation of the soil.

The soil for beet is cultivated with great care; it is ploughed twice; the first ploughing is shallow, from 4 to 5 vershoks; the second deep, from 7 to 8 vershoks. The time for the ploughing depends upon the time of sowing, namely: if after cereals the field is ploughed for the first time immediately after harvesting the grain, and the second time, just before winter sets in. If beet is sown after fallow then the first ploughing of the field is in the middle of May, and the second, or deep ploughing, six

weeks later, and then it is immediately harrowed. In some well organized farms, in order that the horse or ox put to the harrow should not trample down the newly ploughed earth, side-draught harrows are used. Thus the harrow is so arranged that the horse following the plough walks in the furrow and the harrow follows on the fresh earth. After the field is harrowed it is not touched till the spring when it is again freshened and the upper layer of earth is mellowed with the aid of a weeder. This spring work is done from the first days of March to the middle of April.

The instruments used for the cultivation of beet fields are always of a very good construction, sometimes foreign and sometimes Russian; on some of the better farms steam ploughs are used. The sowing of beet begins generally in the first days of April and continues until May. The so-called early sowing takes place in the second half of March; the late, at the end of April and the beginning of May. It sometimes happens that beet sprouts are attacked by insects which destroy them, so that the crop has to be sown a second time, in which case the sowing continues till the end of May.

Generally beet is sown in rows and sometimes, though seldom, in squares. For sowing in rows two pounds of seed are scattered to the dessiatine, the seeds being first soaked and sown when damp, thus hastening their sprouting. Wherever beet is grown in considerable quantities it is sown with drills of different constructions; and in the government of Kiev special drills are made for this work, namely in Smela by Count Bobrinsky and in Belaia Tserkov by Mentsel. Now, however, these drills are seldom used and are being replaced by others of foreign make. When the first sprouts appear and the first 2 or 4 leaves are developed the field is weeded and the upper layer of soil mellowed. Such weeding and mellowing are done simultaneously, with a light hand machine called motiga. Afterwards the superfluous sprouts are pulled out so that a distance of 6 to 7 vershoks remains between the plants. The weeding and mellowing process is repeated five to six times until the leaves cover the ground. All the work of beet cultivation, although it requires a great number of workmen, is generally done by hand, as labour is very cheap and machine work very little developed in Russia.

During its growth beet is often visited by different diseases which are occasioned by parasitic mushrooms, as for example: *uromyces betae* Tub, which makes the leaves rust; *de pazea betaecola*, which dries up the leaves; *perenospora betae* Schacht, which causes the heart of the beet to decay. Among the insects which attack the plant in the principal regions of beet cultivation, the most dangerous is the *cleonus punctiventris*. It appears in April or May, feeds upon the young sprouts and destroys them in great quantities to the despair of the producer. In order to get rid of them the workmen gather them with the hand and burn them, or else water-ditches are dug around the fields, and the insects in going over from one field to another fall into the water, where they are easily destroyed. In the Vistula regions this insect is quite unknown. Much harm is done to beet by big earth fleas *haltica nemorum* and *haltica olerocea* and by the caterpillar *botis sticticalis*, which feeds upon the leaves. There is a great number of other insects which attack the beet but the harm done by them is not very great.

In the beginning of September, and sometimes at the end of August, the producers begin harvesting and finish about the first of October. The crop is gathered by hand with the aid of a spade or with an earth fork with two prongs specially prepared for the purpose, as yet there is no digging machine for this work.

As soon as the beet is taken out of the ground it is cleaned somewhat of earth, the top with the leaves, from 1 to 1·5 dume, and the thin part of the root are cut away, and this on the field. In cutting the top and the root, great care is taken not to injure the bulb, otherwise it would quickly decay; it is then left on the field for sometime in small heaps, and covered with leaves or earth. Where great quantities of beet are grown the crop is preserved, in the following way: ditches, 100 feet long, from one and one-half to two and one-half archines wide, and from one and one-half to two feet deep, are dug, and generally in the direction from north to south. The beets are thrown into these ditches till the heap is two to two and one-half arshines above the surface; then they are either buried with naked earth, or are previously covered with straw. The layer of earth covering them is gradually augmented as the cold weather comes on, and attains in winter two to two and one-half feet. Sometimes beet is thrown into large heaps direct on the earth and buried. That the temperature in these beet heaps should not become too warm small openings 2 to 3 sogenes are made into the mounds, and straw or wooden ventilators introduced.

The beet harvest is subject from year to year to great fluctuations, dependent upon the localities of the crop. In the south-western governments, such as Kharkov and Bessarabia, and especially in the regions of the Vistula, the crops are best. In the latter regions a dessiatine gives generally more than 100 berkovets, and in some farms from 150 to 180 and even to 250 berkovets per dessiatine. In the northern and eastern governments the harvest is poorer; thus, in the government of Tula in some farms it does not exceed 120 berkovets, while on others it reaches 150 berkovets to the dessiatine; but in general it does not attain 100 and fluctuates around 80 berkovets. In the governments of the Vistula the harvest of beet is more uniform than in others, owing to a better method of cultivation there. The following table shows the different harvest and its fluctuations in different governments during the years 1888 to 1892:

**Beet harvest from per dessiatine expressed in berkovets.**

Governments.	1888.	1889.	1890.	1891.	1892.	Average.	Minimum.	Maximum.
Ekaterinoslav . . . . .	135·12	26·18	36·94	—	—	66·08	26·18	135·12
Samara . . . . .	89·01	94·17	44·89	56·79	45·08	65·99	44·89	94·17
Orel . . . . .	73·13	71·00	60·00	44·00	47·94	59·21	44·00	73·13
Chernigov . . . . .	90·03	31·75	98·16	83·93	74·77	75·73	31·75	98·16
Voronezh. . . . .	122·50	60·75	93·78	37·63	59·99	74·93	37·63	122·50
Tula. . . . .	98·33	100·14	79·64	43·32	30·74	70·43	30·74	100·14
Tambov . . . . .	109·93	80·41	81·80	60·35	83·64	83·23	60·35	109·93
Poltava . . . . .	107·51	100·46	87·53	75·95	85·01	91·29	75·95	107·51
Koursk. . . . .	115·17	112·00	97·46	78·00	82·53	97·03	78·00	115·17
Volyn . . . . .	99·89	107·56	115·78	97·62	94·67	103·10	94·67	115·78
Podolsk . . . . .	116·35	108·29	107·40	96·65	77·72	101·28	77·72	116·35
Kiev. . . . .	115·26	108·83	118·78	105·55	75·42	104·77	75·42	118·78
Kharkov . . . . .	148·71	139·33	96·87	104·65	93·81	116·67	93·81	148·71
Bessarabia . . . . .	154·94	130·92	145·20	105·20	108·14	128·88	105·20	154·94
Average in the Chernoziom gov.	112·56	90·84	90·30	76·13	73·80	88·47	62·59	115·03
Minimum. . . . .	73·13	26·18	36·94	37·63	30·74	59·21	26·18	73·13
Maximum . . . . .	154·94	139·33	145·20	105·55	108·14	128·88	105·20	154·94

Governments.	1888.	1889.	1890.	1891.	1892.	Average.	Minimum.	Maximum.
Plotsk . . . . .	80·09	88·92	123·80	98·67	97·22	97·74	97·22	123·80
Sedlets . . . . .	72·52	110·57	123·10	101·48	99·71	101·48	72·52	123·10
Warsaw . . . . .	99·03	101·98	122·41	97·99	96·87	103·66	96·87	122·41
Petrokov . . . . .	103·65	107·30	139·00	85·95	82·69	103·72	82·69	139·00
Kalish . . . . .	112·41	111·00	132·33	90·08	110·40	111·24	90·08	132·33
Kelets . . . . .	100·61	102·00	128·31	88·52	115·24	106·94	88·52	128·31
Lomzha . . . . .	115·44	108·87	149·42	97·23	120·73	118·34	97·23	149·42
Lublin . . . . .	110·59	130·76	143·10	101·93	112·17	119·71	101·93	143·10
Radom . . . . .	131·80	133·61	153·70	111·81	114·28	129·04	111·81	153·70
Average harvest in the Vistula gov.	102·85	110·56	135·02	97·07	105·48	110·20	93·21	135·02
Minimum. . . . .	72·52	88·92	122·41	85·95	82·69	97·74	72·52	122·41
Maximum. . . . .	131·80	133·61	153·70	111·81	120·73	129·04	111·81	153·70

The quality of beet produce varies considerably dependent upon the place, the year and the means of cultivation. Generally beet contains 13 to 14·5 per cent of saccharine matter, and sometimes it attains to 15 and 16 per cent. Beet in the governments of the Vistula contains the greatest proportion of sugar; next come the south-western governments, followed by other localities. The quantity of saccharine material in beet for the years 1886 to 1890 is shown in percentage in the following table:

	1886.	1887.	1888.	1889.	1890.	Average.
Vistula governments . . . . .	14·38	14·16	14·45	14·94	14·81	14·55 per cent.
South-western governments . . . . .	12·88	13·10	14·40	12·40	13·49	13·25 » »
Other governments . . . . .	13·13	12·35	13·66	12·34	13·63	13·02 » »

The following table shows that beet of good juice is also produced principally in the governments of the Vistula. Juice of good quality is that in which the per cent of saccharine matter is the same as that of the dry residues.

#### Juice of good quality.

Governments.	1886.	1887.	1888.	1889.	1890.	Ave- rage.	Mini- mum.	Maxi- mum.
Ekaterinoslav . . . . .	78·15	75·45	72·59	70·92	79·14	75·25	70·92	79·14
Tula . . . . .	73·28	76·44	75·63	74·95	76·06	75·27	73·28	76·44
Samara . . . . .	77·17	78·21	80·14	77·87	75·39	77·76	75·39	80·14
Bessarabia . . . . .	77·98	79·27	79·32	76·63	77·79	78·19	76·63	79·32
Poltava . . . . .	79·16	75·20	79·65	77·46	79·69	78·23	75·20	79·69
Voronezh . . . . .	77·44	77·41	81·23	75·66	79·81	78·31	75·66	81·23
Chernigov . . . . .	79·24	77·65	79·89	79·28	76·75	78·56	76·75	79·89
Kharkov . . . . .	80·86	77·37	79·28	79·72	79·52	79·35	77·37	80·86
Orel . . . . .	84·19	78·35	79·23	77·56	79·31	79·73	77·56	84·19
Tambov . . . . .	78·70	79·05	81·21	80·37	80·40	79·95	78·70	81·21
Kursk . . . . .	80·14	78·91	80·69	80·11	79·02	79·97	79·02	80·69
Podolsk . . . . .	79·81	80·05	81·34	79·73	80·86	80·36	79·73	81·34
Kiev . . . . .	79·78	80·48	81·07	80·04	80·68	80·41	79·78	81·07
Volyn . . . . .	81·54	81·50	83·36	82·02	81·94	82·07	81·50	83·36
Average . . . . .	79·90	79·52	80·60	79·42	80·25	78·82	76·96	80·61
Minimum. . . . .	73·28	75·20	72·59	70·92	75·39	75·25	70·92	76·44
Maximum. . . . .	84·19	81·50	83·36	82·02	81·94	82·07	81·50	84·19

Governments.	1886.	1887.	1888.	1889.	1890.	Ave- rage.	Min- imum.	Maxi- mum.
Kelets . . . . .	80·56	82·33	82·36	82·52	82·73	81·99	80·56	82·73
Petrokov . . . . .	83·25	82·63	83·01	83·60	84·09	83·32	82·63	84·09
Lublin . . . . .	81·28	81·46	84·97	85·07	84·26	83·41	81·28	85·07
Radom . . . . .	84·70	81·34	83·89	84·09	84·31	83·67	81·34	84·70
Lomzha . . . . .	84·82	82·89	83·13	82·76	85·24	83·77	82·76	85·24
Plotsk . . . . .	83·87	86·05	84·94	82·91	85·27	84·61	82·91	86·05
Sedlets . . . . .	82·36	84·84	85·48	85·92	84·61	84·64	82·36	85·92
Warsaw . . . . .	84·53	84·44	83·77	85·06	85·47	84·65	83·77	85·47
Kalish . . . . .	83·76	84·05	84·25	85·75	86·58	84·88	83·76	86·58
Average . . . . .	83·60	83·89	83·38	84·89	85·20	83·88	82·37	85·09
Minimum. . . . .	80·56	81·34	82·36	82·52	82·73	81·99	80·56	82·73
Maximum. . . . .	84·82	86·05	85·48	85·75	86·58	84·88	83·77	86·58

The expenses of beet culture are rather great, as the plant requires during its whole growth great care and much nursing. According to the information given by the Department of Agriculture and Rural Economy for the governments of Kiev, Podolsk, Volyn, Kharkov and Koursk, the expenses of beet cultivation are subject to great fluctuations. In general they are about a 100 roubles per dessiatine, falling in some places to 70 and rising in others to 150 roubles, not taking into calculation the rent of the ground; including ground rent, these expenses vary from 80 to 163 roubles per dessiatine. According to the harvest, a berkovets of beet costs the planter from 70 kopecks to 1·75 roubles, but generally a little less than 1 rouble. The price of a berkovets of beet at the factories is from 1 to 1·55 roubles.

The following table shows, though only approximately, the cost and the profit of the sugar beet culture:

Governments.	Harvest in berkovets per des- siatine.	All expen- ses, rent included.	Cost of cul- ture per berkovets.	Selling price per berkovets.	Harvest price per dessiatine.	Profit + Loss - per des- siatine.		
						R	o	u
Kiev . . . . .	139·5	128·35	0·92	1·228	171·80	+ 43·95		
	70	78·95	1·125	1·25	87·50	+ 8·55		
	72	93·04	1·29	1·0	72·0	- 21·04		
	130·5	91·25	0·70	1·0	130·50	+ 39·25		
	100	104·0	1·04	1·30	130·0	+ 25·80		
	—	151·28	—	—	108·75	+ 27·47		
Podolsk . . . . .	120	87·33	0·728	1·0	120·0	+ 32·67		
Volyn. . . . .	90	87·85	0·97	1·0	90·0	+ 2·15		
Kursk . . . . .	203	147·60	0·72	1·0	203·0	+ 55·40		
Kharkov. . . . .	130	148·22	1·14	1·45	188·50	+ 40·28		
	191·6	163·0	0·85	1·04	199·26	+ 36·26		
	152·7	134·0	0·88	1·04	158·80	+ 24·13		
	139·5	152·0	1·10	1·25	174·38	+ 24·42		

Beet cultivation has had a very wholesome effect upon Russian agriculture by bettering the methods of field cultivation in general and by introducing not only to estates but also to peasant farms perfected machinery and farm implements.

### H O P S.

The hop for preparing weak spirituous liquors has been known in Russia since very remote times. According to historical information, the Russians were acquainted already in the tenth century, with such liquors as beer and *b r a g a*, which they probably prepared from wild hop, which grows until the present day in great quantities in many governments of European Russia. Later on, the hop began to be cultivated in fields specially appointed for it, in like manner as other agricultural plants; and in the fourteenth century in the government of Novgorod, it was regularly cultivated. In the purchase deeds of that time hop plantations were often mentioned, forming, probably together with other agricultural industries, an indispensable attribute of the villages.

At the present time the hop is cultivated over all European Russia but in very small quantities, and principally by peasants for their own use. Till now the custom exists among peasants of preparing, just before great holidays, beer and *b r a g a* from their own hops, and sometimes even of wild hops. For trade, this vine is cultivated in localities of the non-Chernoziom regions of Russia since the last century and is principally in the hands of the peasants; in the south-west of Russia, in the government of Volynia, it has begun only recently to be grown, as also in the Vistula governments.

In central Russia it is cultivated: 1. in the locality known under the name of *G u s l i t s i*, situated on the borders of Guslitsa and Nerskaia, in the districts of Bogorodsk and Bronnitsi, government of Moscow, in the district of Egorievsk, government of Riazan, and in the district of Pokrovsk, government of Vladimir; 2. in the district of Kasimov, government of Riazan, on the left border of the Oka; 3. in the environs of the town Souzdal, government of Vladimir; 4. in the district of Kostroma and especially in the *M i s k o v s k a i a v o l o s t* where the peasants cultivate no cereals; but only hop; 5. in the districts of Cheboksarsk and Tsarevokokshaisk, government of Kazan; 6. in some parts of the government of Nizhni-Novgorod.

In south-western Russia hop culture is centralized in the government of Volynia, chiefly in the district of Dubensk and in the districts of Rovna, Loutsk, Ostrozhsk, Vladimir-Volynsk and Zhitomir. Here hop culture was introduced by the Bohemians, who in 1860 came to Russia from Austria in several ten thousand colonists. In all their colonies hop plantations flourish and at present the cultivation is also spreading among the local estate owners and peasants.

In the Vistula regions the hop vine is cultivated in the governments of Kalish, near the town of Kalish, and partly in those of Kelets, Radom, Warsaw and Lublin, and in some places of the districts of Belostok and Grodno.

Finally, about the year 1880, some large estate owners attempted to plant hops in the governments of Moscow, Riazan, Tula, Koursk, Kharkov and Poltava, and for the greater part these attempts have been successful.

The regions Guslitski, Kostromskoi and Volynski are of the greatest importance in Russian hop culture as to the quantity of hop produced, and the signification that hop culture has for the inhabitants. In the first two, as has been mentioned above, hop has been cultivated from ancient times; the Guslitski region is especially noted, as the

peasants, having a soil unfit for cereal culture, have turned their whole attention to hop growing, since the past century. This crop extended its fields gradually and in the forties attained its full development. About 1850 the product in Guslitsi amounted to 50,000 pouds, and the Guslitski sorts of the plant were renowned over all Russia. All these sorts are early varieties and are called, *brouuskovi*, *krougliak*, *skripouchnik* and *rourkhliak*. Now these species are not strictly distinguished; the first two are of good quality and prized alike. *Skripouchnik* has quite passed away and only two sorts remain: the Russian *yadreni krougliak*, and *rikhliak* or *pochinski*, which are also beginning to lose their importance, as they do not serve for preparing good beer and are gradually replaced by the foreign species.

In the *kostromskoi* regions hop culture is also fully in the hands of the peasants. Formerly the crop amounted to 45,000 pouds, about 1870 from 28,000 to 30,000 pouds were harvested, and from 400 dessiatines; in 1880 only 20,000 pouds were harvested. Hop of the region of Kostroma is of very low quality, coarse, large, poor in lupulin and very seedy. Formerly another species was cultivated called *kounikovski*, but towards 1855 it degenerated, was subject to disease and was replaced by *guslitski*. The manner of hop culture is very primitive here: the soil is badly cultivated; the roots are not cut; the distance between the plants is not considered; on the same pole too many vines are permitted to climb, sometimes as many as twelve, instead of two or three. Hops are generally dried in barns like those used for cereals, and sometimes in specially constructed buildings, generally by wood fire or coals, and not by warm air, as in western Europe. The best sorts of hop are dried by birch charcoal fires; wood is used only for the low grades in villages, as the smoke of the wood gives a particularly disagreeable odour to the vine.

Until 1840 beer was used only by the peasants in Russia and only since that time has the drinking of beer become universal. Till now two kinds only are brewed: the low grade, which ferments superficially, is black and sweet, and very much like home made beer; the other sort, which ferments to the bottom, is bitter and white, and is a high class beer. For preparing the low grade beer, Russian hops are good enough; but owing to their bad natural qualities, and because they are imperfectly dried, they are not used for brewing the best beer.

The first import of hops into Russia was in 1844, since which date the importation has increased in proportion to the production of high grades of beer, at first not more than several hundred pouds; but already in 1869 the manufacture of high grade beer attained 17,000 pouds, and has steadily increased to the present day. Such a competition of foreign hops, which although dearer are better suited for beer-brewing, reflected badly on the hop-producing regions and the crop began everywhere to decrease, the prices for Russian growths falling to 3 roubles per poud. In 1870 the quantity of hops cultivated in the Guslitsk region diminished one-half.

Such a decline in this important branch of husbandry attracted the attention of the Ministry of Crown Domains, and beginning with 1873 a whole series of measures were enacted to develop and sustain the industry. A specialist was sent to the principal hop-growing regions with instructions to study the state and needs of the case, after which the adoption of the following measures were found necessary: 1. Governmental aid in the cultivation of the best varieties of foreign hops; 2. the furnishing to the peasants of the necessary implements; 3. the giving of practical advice as to the

best methods of cultivation; and finally, the establishing of a series of hop exhibitions in the principal towns at which medals were awarded to the best hop growers of the several districts.

First of all the Ministry of Crown Domains imported on its own account a large quantity of hop grafts of different sorts, from the best foreign and local pothouses, namely, *s a a t z*, *s h p a l z*, *s h w e t z i n g e n*, and *r o g a t i n*. These grafts were sent in large quantities free of cost to the hop growers, until in 1888, 150,000 grafts were thus distributed. The Ministry, furthermore, distributed free the necessary implements, such as spades, garden knives, hooks for extracting stamens and the like. Moreover specialists were appointed to superintend the industry and to give instruction to all who were in need of it. Furthermore, in order to propagate rational knowledge of hop cultivation the Ministry pays since 1884 a yearly subsidy of 2,000 roubles to the support of the Hop Cultivation School, established by a private individual in the government of Minsk. Finally, in 1887 by request of the hop growers, a duty was set on the foreign product of 10 roubles gold per poud for the raw material, and of 30 roubles for hop extract.

The chief interest of the Government was given to the Guslitsk and Kostroma regions, although the other hop districts were also materially assisted.

The *s p a l z* hop grown in Guslitski, although having lost some of its natural qualities, can still be considered, because of its excellent yield and the amount of lupulin it contains, more than twice as good as the local varieties, and prices have ranged accordingly: thus, in 1876 Bohemian hops of Guslitzki production cost from 18 to 25 roubles, whereas the local sorts sold from 5 to 6 roubles per poud. The following table shows the results of a mechanical analysis of hops of different sorts, grown in the hop nursery of the Petrovsk Rural Academy near Moscow, the difference in the qualities of Russian and foreign sorts being set forth.

Analysis of hop heads.	Parts in a hundred.				
	Flower buds.	Seed.	Germ.	Stems.	Bracts.
Varieties:					
Bohemian red . . .	10·8	5·5	1·5	13·4	68·8
Bavarian (spalts) . .	12·1	4·5	1·6	13·7	68·5
» late . . .	10·9	5·7	1·2	12·5	68·5
Shvelzingen . . . .	10·2	5·8	1·7	12·4	69·5
Brouskovoigouslitski	7·0	10·9	1·6	13·8	66·1
Krougliak . . . .	8·2	5·6	2·2	14·3	69·5
Pochinski . . . .	3·9	10·3	1·3	14·2	69·9
Bitugski . . . .	5·9	9·6	1·7	14·6	68·1
Tver (pothouse) . .	6·2	6·7	1·7	14·8	70·4

Notwithstanding the improved measures undertaken in the cultivation of hops in Guslitsk, the crop will probably not prosper very long, neither in Guslitsk nor in the

other northern regions, because of the unfavourable climate. The Volyn region is under more fortunate conditions, this branch of industry being in the hands of Bohemian colonists who grow exclusively the Bohemian species, saats. The crop grown in this region is of very good quality, although somewhat different from that grown in Bohemia. In the middle of the eighties from 20,000 to 25,000 pouds were collected in Volynia, and its production, gradually increasing, has risen until the present day the crop is 40,000 pouds.

The total quantity of hops cultivated in Russia cannot be exactly defined, as there are no reliable statistics on this point. According to some data the quantity collected in the principal regions of its cultivation attains 100,000 pouds, and in the whole of Russia, about 150,000 pouds; however, these figures are rather uncertain and require verification, as other sources show that in 1888 in the Guslitsk region alone about 85,000 pouds were harvested.

The centre of the hop trade in the Guslitsk region is the Ilinski pogost, where there are weekly markets; the buyers are small dealers and commission merchants; so that hops before coming to the consumers pass through many hands. The Kostroma hop is also bought by various agents, who transport it to Vologda, Griazovets, Archangel and other towns of the Kostroma, Yaroslav, Tver, and Novgorod governments. In the end of December hops are brought to the Kreschensk market in Vesiegonsk, and in February to the market in Rostov. The prices for this crop are very low, from 3 to 4 roubles her poud.

From the Volyn district, where hops are of good quality, scarcely inferior to the best foreign sorts, the product is partly taken direct to the breweries.

The local prices fluctuate greatly from year to year; thus, according to data of the Department of Agriculture and Rural Economy, in the Guslitsk region a poud cost in 1888, from 18 to 22 roubles; in 1889, 26 roubles; in 1890, from 10 to 15 roubles; whereas in 1891 the prices fell to 5 and 7 roubles per poud. In the Dubensk district of Volynia a poud of hops for export cost in 1888, 20 roubles; in 1889, in the Zhitomir and Dubensk districts, from 15·50 to 26 roubles; in 1890, 12 to 25 roubles according to the quality, and in 1891 the prices fell to 6 and 8 roubles per poud. The following table shows the amount of foreign hops imported into Russia.

Years.	Import in pouds.	Value.
In 1882	59,401	1,012,713 roubles
» 1883	77,913	1,682,390 "
» 1884	78,940	1,538,337 "
» 1885	69,348	1,232,124 "
» 1886	84,987	1,571,587 "
» 1887	33,783	709,433 "
» 1888	37,562	960,265 "
» 1889	55,505	1,257,132 "
» 1890	40,144	1,060,094 "
» 1891	26,088	946,622 "

The export of hops until the fifties was very considerable and rose sometimes to 20,000 pouds; in the fifties the highest figure of export was 14,834 pouds; during the sixties the quantity exported varied greatly, falling in some years to 600 and 800 pouds, and in others rising to 70,000 pouds. In the seventies the export fluctuated between 400 pouds in 1873, and 6,023 pouds in 1876. In the last decade hops were exported as follows:

Years.	Pounds.	Roubles.	Years.	Pounds.	Roubles.
1880	1,390	11,690	1886	2,383	24,566
1881	5,382	93,037	1887	246	3,463
1882	43,528	785,072	1888	255	6,156
1883	30,055	345,571	1889	101	1,791
1884	42,493	712,297	1890	6,876	127,583
1885	916	10,043	1891	52,473	799,559

#### ANISEED AND CUMIN.

Aniseed (*pimpinella anisum L.*), belonging to the family *umbelliferae*, is cultivated as an agricultural industry only in a few places of Russia, and generally by peasants. It is principally grown in the Biruchinsk, Valuisk, and Ostrogozhsk districts of the Voronezh government. The data of 1882 show that there were 1,718 dessiatines in the Valuisk and 1,700 dessiatines in the Biruchinsk districts under aniseed. It is also sown in large quantities in the Oushitski district of the Podolsk government, to some extent in the Novooskolsk and Korochansk districts of the government of Koursk, and in some places of the Kharkov, Tauride and Kherson governments.

Aniseed is sown broadcast, from 30 to 40 pouds per dessiatine, early in spring, and the crop is weeded several times during its growth. In August it is harvested either with a sickle or pulled; it is thrashed with a flail. The amount of grain collected per dessiatine varies from 20 to 80 pouds, rarely 100 pouds; the average is from 30 to 50 pouds.

Part of the crop is used for oil; part is consumed over all Russia as medicine and wine, and part is exported, chiefly for preparation of alcoholic drinks. The centre of the anise trade are the villages Krasnaia and Alexeevka, in the governments of Voronezh, where yearly from 150,000 to 200,000 pouds are sold and where buyers come even from abroad. The prices until 1888 and 1889 were good, for example, in the Biruchinsk district in 1885 a poud brought from 2·80 to 3·30 roubles; in 1886, from 1·90 to 2·30 roubles; in the government of Koursk in 1889 a poud cost from 2 to 3 roubles; the price fluctuated in general between 1·20 and 3·50 roubles per poud. From 1888 and 1889 the prices weakened exceedingly, ranging from 60 kopecks to 1 rouble, causing in many places a decrease in the sowings, as the anise crop requires much labour and time, and the expenses of cultivation could not be covered at such low rates.

The following table shows the amount of aniseed exported from Russia in the last decade and the countries to which it was sent:

Years.	Total export.		Export of aniseed to:							
	Pounds.	Total in roubles.	Germany.		Austro-Hun- gary.		France.		Great Britain.	
			Pounds.	Per cent.	Pounds.	Per cent.	Pounds.	Per cent.	Pounds.	Per cent.
1882	59,915	169,081	28,188	47·0	16,892	28·2	11,663	19·4	—	—
1883	85,164	265,854	47,070	55·2	18,845	22·1	11,943	14·0	—	—
1884	87,815	314,709	47,601	54·2	26,644	30·4	10,428	11·9	—	—
1885	94,170	312,629	39,267	41·7	38,828	41·1	10,032	10·6	3,482	3·7
1886	168,590	595,097	89,344	53·0	31,363	18·6	33,357	19·8	8,681	5·2
1887	192,155	582,922	108,025	56·2	50,357	26·2	19,809	10·3	5,960	3·1
1888	168,115	520,575	33,392	19·8	71,358	42·4	46,756	27·8	10,551	6·3
1889	138,756	456,485	47,403	34·2	31,577	22·8	30,872	24·3	15,526	9·7
1890	195,874	627,945	70,521	36·0	46,233	23·6	49,977	25·5	11,079	5·6
1891	176,064	504,410	44,790	25·4	45,956	26·1	70,522	40·0	8,726	9·4

Cumin (*carum carvi L.*), as well as aniseed belongs to the family umbelliferae; it is very little cultivated in Russia, and exclusively by peasants, in several places of the non-Chernoziom region, namely in the Rostov district of the government of Yaroslav, and here and there, in the adjacent governments, near the town Korochi in the government of Koursk, and the Ostrogozhsk district, government of Voronezh. In recent years attempts have been made in several western governments to cultivate cumin, but there are no data as to the results of these experiments. Cumin grows wild in many governments, and the collection of its seeds forms one of the small industries of the peasant.

The export of cumin from Russia is not great, especially in the last four years as seen from the following table, which also shows that the chief consumers are Germany and Great Britain.

Years.	Total export.		Exported of cumin to:					
	Pounds.	Total in roubles.	Germany.		Holland.		Great Britain.	
			Pounds.	Per cent.	Pounds.	Per cent.	Pounds.	Per cent.
1882	50,732	227,633	9,129	15·5	3,154	6·2	21,301	41·9
1883	14,343	63,825	9,209	64·2	3,185	22·2	1,811	12·6
1884	17,956	86,395	14,600	81·1	2,115	11·8	1,107	6·2
1885	8,426	35,020	4,690	55·6	2,102	24·9	—	—
1886	27,299	76,913	5,566	20·4	—	—	20,108	73·6
1887	27,522	112,362	10,842	39·3	3,935	14·3	11,835	43·0
1888	9,816	45,291	7,691	78·3	—	—	—	—
1889	11,931	34,367	5,283	44·2	—	—	4,158	34·9
1890	3,734	14,300	2,310	61·9	—	—	—	—
1891	9,177	33,236	4,843	52·7	—	—	3,291	35·8

## M I N T.

Mint (*mentha*), belonging to the family *labiatae*, is cultivated as an article of trade in very few places in Russia; the centres of the industry, held from ancient times exclusively in the hands of the peasants, are Porechie and Ougodichi in the Rostov district of the government of Yaroslav; however, mint is cultivated to some extent in Bogoroditsk, Venevsk and Kashira districts of the government of Tula, near the town Kazan, and here and there in the Voronezh, Orel and Kherson governments.

Three different sorts of mint are cultivated in the above-mentioned regions: the peppermint, or English mint, (*mentha piperita*), the curl mint or German mint (*mentha crispa*), and the Russian simple mint (*mentha viridis*); all these sorts are grown for the oil and for the leaves which are used in the preparation of medicines, perfumes, and in the manufacture of candy and aromatic drinks, especially in the preparation of *kvas*, the popular beverage of Russia.

The cultivation of mint requires little labour; it is grown in beds, and being a perennial plant does not demand yearly sowing; it happens however that the roots perish through frost, in which cases additional sowings are necessary; young roots are used for that purpose. The only nursing consists in weeding. The harvesting begins at the time of blossoming, and the stalks are cut with the sickle close to the ground, after which the bed is carefully swept with a besom, a sort of birch broom, in order to collect the fallen leaves, which are of some value. The harvest of mint averages, for the curl mint, about three-quarters of a poud per bed, the English sort somewhat more, namely, from 1 to 1·25 pouds. Mint, after harvesting, if not delivered direct to the oil factory, is tied into small bundles and dried, as a rule under the cottage roofs of the peasants, in the draught; four to five pouds fresh give about one poud of dried mint.

The oil is fabricated from fresh mint in summer, and from dry mint in winter. The construction of the factories is very simple: boilers are inserted into ovens and are filled with mint grass, according to the dimensions of the boiler, from 2·50 to 4 pouds of dry mint, or 20 pouds of fresh per batch; the boiler is then filled with water and tightly closed with a lid, furnished with a pipe or simple still, passing through a refrigerator; the heating is with wood. The oil together with the water is collected in bottles, placed under the pipe; from these bottles the oil is extracted with spoons especially constructed for the purpose. The process continues from three and one-half to five hours only. The amount of oil obtained depends upon the grade and the age of the crop when harvested; thus if gathered after it has blossomed, according to data of the village Porechie, 18 to 20 pouds of damp grass will produce one pound of oil; but if harvested before blossoming, 30 pouds of fresh grass are required to obtain one pound; from 2·20 to 5 pouds of dry mint are required to secure one pound of oil.

There are no exact data on the mint production; the following table shows the average amount of dried mint prepared in the village Porechie only:

Peppermint,	5,000	pouds,	at 2·50	roubles,	total	12,500	roubles.
Curl	"	500	"	3·00	"	1,500	"
Simple	"	300	"	2·00	"	600	"

Dried mint, mint leaves and oil go principally to St. Petersburg, Moscow and Nizhni-Novgorod. On the places of production in 1887 and 1888, in the Rostov district,

a poud of dried curl mint brought from 2·50 to 4 roubles; peppermint, from 1 to 1·50 roubles; the second crop of curl mint cost 1·20 to 1·50 per poud, and the leaves from 1·50 to 2 roubles. A pound of oil in the same region cost from 8 to 9 roubles, from peppermint; and 12 roubles, from the German mint; whereas in the Venevsk district 6 to 7 roubles, from the German, and 11 to 12 from the peppermint, would indicate the prices of the oil.

### C H I C O R Y.

Chicory (*cichorium intybus* L.), belonging to the family *compositae*, is cultivated for its roots, which serve for the preparation of the widely used succedaneum, or part-substitute for coffee. Chicory is principally cultivated in the Rostov district, and partly in the adjacent districts of the Yaroslav government. The industry is chiefly in the hands of peasants and forms a very important branch of their farming. About 400,000 pouds of dried chicory are produced annually in the Yaroslav region. Besides this, it is also cultivated in the Soudal district of the Vladimir government, in the Vistula and partly in the Baltic provinces, by peasants as well as by land-owners. Chicory is sold to factories situated in the vicinity, or in large centres, where it is burnt and ground; or it is sent to market unburnt. From recent cultivations of chicory in different parts of southern and northern Russia, namely in the governments of Volyn, Kovno, Pskov and Vologda, experiments have showed that the crop is not difficult to grow, and that it yields good harvest in all the above-mentioned places, in the Chernoziom as well as the non-Chernoziom soil. In the Yaroslav government it flourishes best on porous, sandy soil. The earth must be deeply ploughed and fertilized exclusively with animal manure, but should not be sown directly after manuring, as in that case the roots grow too many branches; in general it is found necessary to manure chicory fields every two years. After potato, the field is considered to be in good condition for chicory, but in some places of the Rostov district, by reason of the scarcity of land, chicory is sown for 10 years in succession.

Only one sort of chicory is cultivated, namely the local Russian variety, and very rarely the so-called *braunschweig*; but the latter does not differ materially from the Russian, except by its foreign origin. According to the opinion of some authors Russian seeds are more valued than the foreign, so for example in the Rostov district the home seeds are sold for 60 to 100 kopecks per poud, whereas the foreign cost but 40 kopecks. However in some places, as for example, in the village of Poretschie, Rostov district, the local seeds are of very poor quality, and are valued at only 15 to 25 kopecks, the reason being that in order to obtain them, roots that have remained the whole winter in beds are extracted. The production of seeds began to increase in recent years, in the Yaroslav government, because of the increased demand for them from the Vistula and Baltic governments; their production does not represent any difficulty. Roots selected for growing the seeds are stored away during winter in small pits, one arshine wide and three arshines deep; these pits are closed with logs of wood above which straw is laid and the whole covered with earth. The roots thus preserved are in spring planted in beds at a distance of six to eight verschocks apart. The seeds ripen about the end of August, when the crop is cut down, tied into bundles and dried under sheds, after which the seeds are extracted.

The sowing of chicory is either broadcast or in rows, about the end of April, the

earlier the better; about 7 to 10 and sometimes 18 pounds of seed are used per dessiatine. The sprouts appear very soon, in about a week; after three weeks the field is weeded for the first time; two weeks later it is weeded again and at the same time pruned; during its growth it is weeded once or twice more. It is harvested at the end of August or at the beginning of September; the stalks are first cut down and then the roots are extracted. The amount of roots obtained varies greatly; if the harvest is bad, chicory yields 250 to 300 pouds of raw material, but if good, 1,750 pouds, as is the case often in the Rostov district; the average harvest is about 1,000 pouds per dessiatine. The good qualities of the crop consist in having long and large roots, which are used in the preparation of the higher grades of chicory; with good cultivation the diameter of the roots attains three-quarters of a verschock, and the length, half an arshine. After harvesting the roots are washed, slightly scraped in order to obtain the highest white grade of dried chicory, and finally trimmed and cut lengthwise into halves, and then into transverse sections of a quarter of a vershok in thickness: the roots that cannot well be cut lengthwise are used for the lower half-white grades; such roots are crumbed directly after washing; the smallest roots, partly crumbed and partly not, are used for the lowest sorts of succedaneum.

The cut roots are dried either in specially constructed brick ovens or in barns, after the roasting and sometimes before, in the latter case the product is of very low quality, being black and smoky.

The ovens for drying are of very simple construction and have the form of lounges; after the heating is over and the pipe shut, a layer of chicory is put into the oven, and constantly stirred with a sort of rake that the drying may be uniform. That the product may be whiter it must be dried gradually in a slow oven, not too hot. Sometimes the ordinary Russian ovens are used for this purpose, when the chicory is cut up into little bits and a layer placed upon iron sheets with upturned edges. There are no perfected methods of drying chicory.

Dried chicory is very light, although there are no definite data to show its relative weight. According to some authorities it is 12 to 14 per cent of the weight of the freshly washed root, of which from 80 to 90 per cent is of the white or half-white chicory, and 10 to 20 per cent, of the black. By other data one dessiatine gives from 150 to 200, and sometimes 300 pouds of the dried root.

As to the prices, they fully depend upon the quality of the product, which by its colour and means of drying is divided in the government of Yaroslav into several sorts. The best is the so-called *dvoukh-azovi* or *obreznoi*, which is white and bears the mark AA.; the second *azovi*, is darker than the first and bears the mark A. Both sorts are dried in ovens; the difference in the colour depends upon the washing, cleaning and scraping of the root. The third sort is the field-scraped chicory, not very carefully finished and also dried in the oven; this sort bears the mark O. The fourth variety has no mark, it is half-white, washed, dried without smoke and then cut up. The fifth, roasted or smoked, dried in barns with smoke, is of low grade. The prices, dependent upon the quality, were in 1887 the following: chicory, with the mark AA, was sold at 1·50 to 1·75 rouble per poud; with the mark A, at 1·40 to 1·50 rouble per poud; with the mark O, at 1·20 rouble per poud; the half-white, at 70 kopecks, and the chicory dried in barns, at 65 kopecks per poud. These prices are, however, subject to great fluctuations during the year.

The best sorts of dried chicory go to Finland, Riga and St. Petersburg, where the consumers buy the material in the crude state and roast it at home; the lower sorts are bought by manufacturers, who roast and prepare it for the market. Besides the dry chicory the manufacturers buy also the fresh roots. The import of chicory into Russia was very low during the last decade, and fluctuated between 22 and 399 pouds, for the sum of 119 roubles in 1883 and of 1,608 roubles in 1889.

Formerly chicory was in no degree exported from Russia; it began to be sent abroad only in 1889, since when the export in pouds was as follows:

In 1889 exported 63,657 worth 134,569 roubles.

» 1890	»	55,362	»	126,446	»
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» 1891	»	64,536	»	114,341	»
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#### T E A S E L.

Teasel (*dipsacus fullonum* L.), of the family of *dipsacace*, is used in cloth manufacture for teasing the nap. It is cultivated in Russia in very small quantities, although many localities of the Chernoziom regions are well suited to the culture of teasel.

According to statistics teasel is cultivated in the government of Minsk, where it is acclimated, and as compared with other regions, has developed into a considerable industry. Next in importance in this particular come Bessarabia and the Crimea. During late years, according to the data of the Department of Agriculture and Rural Economy, attempts have been made to cultivate this plant in the governments of Grodno and Poltava, and in the latter place the quality of the crop is not inferior to the foreign varieties, although it has not found a ready sale in the cloth fabriques, the manufacturers preferring the imported product.

The teasel harvest in the government of Minsk fluctuates from 200,000 to 300,000 teasel knobs per dessiatine, and as the price is 1·50 roubles per 1,000 pieces, the gross receipts from a dessiatine are from 300 to 400 roubles.

The import of teasel knobs into Russia, from 1882 to 1891, is indicated in the following table:

In 1882 . . . .	33,542	pouds	126,561	roubles.
» 1883 . . . .	21,834	»	152,304	»
» 1884 . . . .	23,111	»	185,350	»
» 1885 . . . .	21,981	»	155,993	»
» 1886 . . . .	21,327	»	122,593	»
» 1887 . . . .	21,467	»	101,142	»
» 1888 . . . .	22,329	»	114,815	»
» 1889 . . . .	21,126	»	104,219	»
» 1890 . . . .	19,389	»	123,978	»
» 1891 . . . .	19,953	»	87,979	»

## CHAPTER IX.

**Gardening and Viticulture.**

Regions under cultivation; technical methods employed; amount cultivated, and dimensions of the trade.

**G**ARDENING, as a means of livelihood has been from ancient times an occupation of the rural population of Russia. In former times, owing to the sparse population of towns and the want of convenient ways of communication, vegetables and fruit did not have any very great trade importance, and were principally cultivated for the use of the growers themselves, only small quantities having been marketed. With the construction of railroads and the development of fabriques and manufactories, orchard and garden produce found ready sale, and now attracts the attention of both large and small dealers. Nevertheless, both kitchen gardening and gardening are very little developed in Russia and, as compared to field work, occupy a small area in the Empire. During late years, however, the Government as well as the different Zemstvos and Societies of Rural Economy have instituted measures looking toward the development of these industries. Especially has great attention been devoted to the efforts to remove the principal cause for the slow growth of gardening and orcharding, namely, the lack of technical knowledge among the villagers.

The Department of Agriculture and of Rural Economy in the years 1880 carefully studied the state of the orchard and garden industries of Russia and the results of that examination were published under the following title: "Statistical Information on Rural Economy, based on Materials received from Landowners", in two separate editions, 1884 and 1885. Moreover, in the yearly editions of the Department, in the works of the Societies of Rural Economy, rich material can be found for studying these branches of agriculture in the different regions.

**KITCHEN GARDENING.**

The vegetables the most grown in gardens in Russia are cabbage, cucumbers, onions, melons and the different bulbous fruits. Sour cabbage and salted cucumbers are the most general supplementary food of the peasants. Moreover, are grown pumpkins, spicy plants, such as red pepper, garlic, cumin, fennel and the like, tomatoes, peas, beans, maize, sunflower, asparagus and chicory. Some of these vegetables, such as maize, sunflower, bulbous fruits, peas and the like, are cultivated in gardens, as well as

in fields, while others are grown only on special and well-manured orchards. The passage from field to garden cultivation is practised in southern and south-eastern Russia, where the resting system of farming exists, by the so-called *bakhchi* or *bashtani* (melon-fields), for which the best resting-fields are used, and that only for one year, when they are used again in field work. The *bakhchi* are neither manured nor watered. Their principal products are the different species of melons, especially watermelons, and therefore melon fields exist in those regions where such fruits can grow in the open air. To this region belong the localities which lie to the south of a line passing to the north of Kaminiets-Podolsk, through Kiev, to the north of Koursk, through Tambov, Penza, Syzrane and Orenbourg; in the eastern governments this line passes more northward, because in these regions the summer is hotter than towards the west. In some parts of the Chernoziom governments, besides melons, cucumbers and other vegetables are grown on *bakhchi*; these garden crops grow also a little to the north of the above-mentioned line.

*Bakhchi* are mostly kept by leasehold farmers who rent, for that purpose, 1 to 40 dessiatines of land. The produce of these melon fields is mostly sold on the spot or in neighbouring towns. In some places the industry attains great proportions, as for instance, in Kamyschine on the Volga, in the governments of Saratov, Samara, Astrakhan, and also in the regions of the Don. These localities provide the two capitals with more than 600,000 pieces of watermelons yearly. The principal varieties of watermelons grown are the following: 1. *kamyshinskie*, very large, white skin with stripes; 2. *astrakhanskie*, round, white and green; 3. *pavlovskie*, from the government of Voronezh; 4. *aleshkovskie*, from the government of Kherson, long green species; and *monasterskie*, very red within. As to muskmelons, the most grown is the common variety with even, yellow skin, of little aroma. In some places better varieties are raised, such as the *doubovka*, from Sarepta, of long form and ripens early, the cantaloupe, ananas and others. From 3,000 to 8,000 watermelons are gathered per dessiatine; the price is 2 to 10 roubles per hundred on the spot; musk melons and pumpkins are cheaper.

Gardening is very little practiced in the southern steppes, south-west and central Chernoziom regions, owing to the great development of melon fields and the want of means of irrigation. In the southern towns the vegetables brought to market from Constantinople compete with those of local production. Gardening is principally centralized in the environs of Odessa and Nicolaev, and in some villages of the Akkermansk and Bendersk districts of the government of Bessarabia. Moreover, as a trade, it exists in some localities on the borders of the Dnieper, in the district of Simferopol, government of Tauride, in the environs of Rostov-on-Don and in Kharkov, in the districts of Zemliansk and Zadonsk, government of Voronezh and from all these places the produce is sent in great quantities to different towns for sale. In different parts of the above-mentioned governments the onion is especially cultivated.

Of the eastern region, gardening is principally developed in the governments of Saratov and Simbirsk. In the vicinity of Saratov, in the Alexandrovsk volost, tomatoes are grown in great quantities, and in the village of Bykovka, cabbage and early potatoes; the former is also much cultivated on the borders of rivers in the districts of Volsk, Serdobsk and on other streams of the Saratov government, where the German colonists grow also many turnips.

In the government of Simbirsk there are 7,000 dessiatines under garden crops; especially are there large numbers of kitchen gardens in the districts of Alatyre and Ardatov; and in the southern parts of that government garden seeds are cultivated in large quantities which are sold at the Simbirsk market.

Towards the north gardening is spread over larger areas. Thus, in the northern Chernoziom governments, the village Bezsonovo on the river Soura, near Penza, is celebrated for its large crops of onion, cabbage, carrot, beet, radish and other vegetables; the onion alone occupies about 600 dessiatines yearly in that village. In the Aksel and in the town Krasnoslobodsk, government of Penza, cucumbers are cultivated in great numbers and sold in the fresh state; the seeds are also much sold. The cultivation of cabbage is principally centralized in some of the villages of the same government. In the government of Tambov, districts of Kozlovsk and Lebediansk, the onion is cultivated, although not in very large quantities. In the governments of Riazan, Tula, Orel and Koursk, gardening is carried on by the local population, and is to a considerable extent in the hands of certain kitchen gardeners who come from Borovsk, government of Kalouga. Gardens are mostly located on the banks of rivers; thus in the government of Tula they are cultivated on the borders of the Oka, Don and Upa; the vegetables from the Oka go mostly to Moscow and St. Petersburg. The government of Riazan produces great quantities of garden seeds; in the Oukholovsk and Pokrovsk volosts, district of Riazan, cucumber and carrot seeds are produced; in the Morozovo-Borkovskaia volost, district of Sapozhkov, carrot, cabbage, cucumber and beet seeds are grown; and in Shatrischina volost, district of Spask, onion seed. The village of Strigounovo, district of Graivoron, government of Koursk, produces yearly 250,000 pouds of onion and garlic, which go for sale to many interior towns, and even to Turkey and Persia. The onion is also cultivated in the government of Chernigov, in Borzenski, Niezhinski and Kozeletsk districts in gardens, as well as on manured fields; kitchen garden seeds are also produced here. In the northern Chernoziom regions vegetables are cultivated in hotbeds to a considerable extent.

Gardening, however, has attained the greatest development in the regions about Moscow and St. Petersburg, as these two capitals of Russia are vast markets for the sale of all sorts of garden produce. The proximity of the capitals, the favourable conditions in regard to atmospheric moisture, and the dense population tend to the development of large centers under garden. The first of these centers is the government of Yaroslav, and especially the Rostov district, in which the people of fifty-five villages occupy themselves with this industry. In the villages, Porechie and Ougodichi, all the fields except pasture land are devoted to gardening. The district of Rostov produces in great quantities dried green peas, chicory, medicinal herbs and seeds of all garden produce. Chicory and peas are sold over all Russia and are exported to a considerable extent; onions, cucumbers, kitchen and medicinal herbs, aromatic plants for ethereal oils, such as thyme, sage, mint, and vegetable seeds have a great trade importance. The government of Vladimir is celebrated for its cucumbers, known under the name of *mouroms kie*, from the town of Mourom, and *vianicovs kie*, from the town of Viazniki. The town Mourom exports in great quantities cucumber seed, known in Germany under the name, Russian seed. The town of Souzdal of the same government produces chicory and horseradish.

The town of Borovsk and its environs, in the government of Kalouga, are also

famous for their garden produce, which consists principally of onions, turnips, asparagus and seeds. Gardening is also much developed in the districts of Tarousk, Kozelsk, Peremishil and Likhvin of the same governments. Gardeners from Rostovsk and Borovsk districts go over all Russia, taking under lease large areas of land and follow gardening as a trade. The kitchen gardeners from Rostov are considered the best specialist of this branch of industry in Russia.

Gardening is much practised in the environs of Moscow and on the borders of the river Moskva; here all sorts of vegetables are grown, such as sweet pea, carrot, beet, turnip, onion, asparagus, Jerusalem artichoke, and others, but of the greatest importance are cucumbers, cabbage and potatoes. These vegetables are sold in Moscow and also sent to St. Petersburg. The village Rogachevka, district of Dmitrovsk, government of Moscow, produces cabbage, known under the name of *rogachevka*; and the village Borisovo, district of Kolomna, is celebrated for its cabbage plants, and onions. The district of Vereisk raises onions and that of Klin grows cucumbers, beans and lettuce in hothouses; beans are also cultivated in hothouses in Tver and its environs. Moreover, Tver produces great quantities of cabbage, cucumbers and other vegetables which go to St. Petersburg. Gardening is very much developed near St. Petersburg and has attained great technical perfection. A great variety of vegetables are cultivated there, both in hotbeds, in hothouses and in the open air. The culture of mushrooms *agaricus campestris*, in hothouses, and asparagus grown under manure, without frames, are the most remarkable branches of gardening in the vicinity of St. Petersburg. In the open air the following vegetables are cultivated near the city: red, savoy and bruxelle cabbage, cauliflower, spinach, radish, lettuce, leek, white and headed cabbage, beet, celery, parsley and carrot; the gardens which are farther from towns produce turnip, cucumbers, cabbage and potatoes. Many early vegetables are imported, however, into the capitals from Germany, Bohemia and France.

Furthermore, gardening as a trade is developed in the government of Kostroma, in the districts of Kostroma and Yurievsk, on the islands watered by the Volga, and in the districts of Nerekhotsk, Galichsk and Makarievsk. In the government of Nizhni-Novgorod the largest gardens are in the suburbs of Pechera and Podnovie, near the town Nizhni, where cucumbers and cabbage are grown, and the districts of Semenovsk and Balakhninsk where cucumbers alone are produced. In the northern governments, such as Archangel, Vologda, Olonets, Viatka and Perm, and also in Finland, turnip is much cultivated on sown fields, mostly on forest lands after the trees and bushes have been burnt down and the ground manured with the ash. On such fields turnip grows very well and is of very good quality. In the western regions of Russia gardening is very little developed, and only by gardeners who come from other places. Many vegetables are brought into the regions of the Vistula from abroad.

Medicinal herbs are cultivated in considerable quantities only in the government of Poltava, districts of Loubensk and a few others. In the government of Yaroslav, district of Rostov, a great quantity of aromatic herbs, such as mint, sage, basil, tarragon, savory, thyme, fennel and many others, are grown.

The technical means of garden culture are various in different localities, dependent upon the climate and soil. These methods have not yet been described in detail although the literature of that branch of industry is very extensive; so that the various methods of cultivation may be seen only from the following examples.

In the southern region of Russia gardens occupy lowlands, easily watered and the vegetables are sown in deep furrows. In the eastern governments, there is often a scarcity of water, and in the government of Saratov the growth of many vegetables is not possible without irrigation. On the contrary, in the northern and eastern localities, owing to great atmospheric precipitation and heavy soil, vegetables are sown generally in beds of one-quarter to three-quarters of an arshine high, that the roots should not be too much saturated by the stagnant water. In the town of Galich, government of Kostroma, where the gardens are inundated every spring by the lake Galich, the waves of which bring and leave vegetable remains on the orchard, forming a black earth called *lyva*, cucumbers are grown in the following manner: In spring, after the overflow, and after the water has regained its normal level, piles are driven into the lake, which are then joined one to another by crossbeams, supported by which a loose floor of fir branches is made upon the very surface of the water. The fir-branch floor is then covered with turf, on which a layer of black earth is laid, 6 vershocks deep. On this section, called *prigate*, circular manure beds, called *lounki*, are made in a row with 20 pouds of manure, 6 to 8 hanging beds can be made. A thickness of half a vershock of lake earth, called *lyva*, is then laid on these beds, after which cucumber seeds, sprouted to half a vershock, are planted therein, about 25 plants per bed, and at a distance of two and one-half vershocks from one another. When the sprouts have taken root and are about a vershock high, they are covered to the very leaves with *lyva* (lake earth) and are watered, at first very little, and then oftener by lake water. These *prigati* are protected from the wind by a wattle hedge, especially from the lake side.

There are also different ways of manuring gardens; some however are never manured, such as melon fields (*bakhchi*), while others are richly fertilized with different kinds of animal manure, horn, chips, different residues of technical industries and other fertilizers, dependent upon the conditions of the several localities. Cabbage and cucumbers are more strongly manured than other vegetables. Artificial manure, such as hyperphosphates and saltpetre are not used in Russian gardening.

The soil of gardens is cultivated partly by horse machines and partly by hand implements, such as spades, hoes and rakes. When the gardens are small cultivation is almost invariably by hand, as also on larger areas when the soil does not easily admit of the use of horse machines. The ploughing, digging, bed-making, manuring, are done by men, while the other work, such as the nursing, watering, weeding, picking, are done by women and children.

In localities where gardening is greatly developed, as for instance, in the district of Rostov, government of Yaroslav, vegetables are grown in beds from one and one-half to two archines wide. In a section there are ten to twenty groups of beds, the sections are separated by paths; these passages between the sections remain always unchanged and are never cultivated. The beds are divided by furrows of three-quarters of an arshine wide. A dessiatine contains about 240 beds, each ten sogenes long. The beds are dug in two different ways: the first method called *raskop*, is employed when the soil has become very hard, as after mint and garlic, and consists in laying the manure, as also the roots and vines, in the furrow between the former beds, and the new bed is made over the furrow from the halves of the adjacent beds. The second method, called *skop*, is very simple and is employed in the spring; it consists in trimming the sides of the

bed with the spade, thus forming the furrows. When gardens are cultivated on a large scale the beds are regularly ploughed. There is no fixed alternation of crops in gardening, and the vegetables are interchanged according to the amount of manure they respectively demand; thus, cucumbers and potatoes are followed by mint, peas, and onions.

Peas are grown in the district of Rostov in gardens and fields; they are principally dried when green, or made into preserves. In gardens, where peas are sowed more densely than in fields, for example, a quarter of an arshine between the rows and from a half to one vershok between each plant, they are of a much better quality. As the peas ripen they are harvested, then shelled, scalded, laid on sieves and dried. The pod is also dried; in winter it is boiled and the water therefrom serves as drink for calves. Dried peas are sorted with the aid of iron sieves of different dimensions. There are three to six sorts of peas, distinguished by their size, and the smallest and greenest sort is valued at 20 roubles per poud on the spot.

Garlic is cultivated as a winter crop; bits of garlic knobs are planted after cucumbers, in round beds (*lounki*), two and one-half vershoks apart. It is sown late in the autumn; the beds are covered with dry branches, in order to keep more snow on them. It does not suffer from spring frosts, and as soon as the snow has melted, it begins to sprout. Garlic is weeded three times; sometimes the sides of the beds are sown with parsley and carrot. In July garlic bulbs are pulled, the roots having been previously cut with a special little spade. When it is ripe the head droops, the stem in then cut off at a vershok from the top. Garlic is dried in specially constructed smokehouses, as without smoke they preserve with great difficulty.

The sorts of vegetables cultivated in Russia are very various and their number increases by intermixing them; the most renowned for their good qualities are: the different varieties of cabbage, kolomenskaia, sabourka, bronka, kaporka, revelskaia, ladozh-skaia, rogachevka, rostovskia, kashirka and voronezhskia; the varieties of cucumber are: mouromskie, moskovskie, viaznikovskie, rostovskie, borovskie, pavlovskie, crimskie, axelskie, krasnoslabodskie and gloukhovskie; turnips are grown in the following species: petrovskia or voschanka, petrozavodskia, rostovskia, krasnoselskaia and kostenevskaia; and carrots, vorobievskaia and davydovskaia; beet, kozhoukhovskaia; raddish, rostovskia, winter white and black sorts; peas, rostovski; beans, rostovskie, white and red; onions, romanovski and rostovski; pumpkins, kievskie poudovie, krimskie kabachki and mouromskie.

There are no data showing the dimensions of garden culture, except slight reference to certain vegetables in separate localities. It can be observed, however, that in general, Russia fully satisfies the home demand for vegetables, and that gardening is developing to a considerable degree. Part of the garden produce is exported, and on the contrary, early vegetables are brought in limited quantities into Russia from abroad.

#### O R C H A R D I N G.

All forms of gardening, such as fruit gardens, show gardens, conservatories, hot-houses, room plants, and flower gardens, are considerably developed in European Russia, but fruit culture has attained the greatest trade importance. Rich landowners, peasants and even villagers and town people, possess fruit gardens. Besides the raising of fruit for the market the cultivation of grafts and of young trees has grown to be an industry

of great importance in some places, and a considerable income accrues therefrom to the people.

Fruit trees are principally grown in the open air. There are, however, producers, especially in the northern localities and in the environs of St. Petersburg and Moscow, who grow such trees as annanas, vines, peach trees and even strawberries, in hothouses in winter. In other regions fruit culture in hothouses is only practised for the use of the owners themselves; and for the trade, all producers prefer to cultivate fruit trees in the open air, and on great areas.

Fruit trees and shrubs grow over all Russia, and sometimes even in the wild state; in the northern part of the country berry bushes, apples and cherries predominate, and towards the south, pears, plums, apricots, grapes, nuts, and peaches. In Asiatic Russia the same is true, except that the limits of the different fruit crops lie more to the south.

In the northern regions of Russia apples are cultivated in the government of Viborg, in the Walaam and Konevetski monasteries on the Ladoga lake, in Vologda and Griazovets, and also in the governments of Olonetsk and Viatka. The governments of Perm, Ufa and Orenburg produce cherries, which grow wild. In the governments of St. Petersburg and Novgorod berry culture is much developed, especially that of strawberries, currants, gooseberries, blackberries and raspberries. In some parts of the Novgorod government cherries and apples are produced in considerable quantities; in the government of Pskov apple tree flourish. Orchards, which formerly were on the decline, have lately begun to show new life.

There are many fruit orchards in the western governments, especially in localities lying near railroads. These orchards produce good varieties of apples and pears, sold at the markets of the two capitals. The government of Mogilev grows a special variety of apple, called *a n t o n o v k a*, that is much prized. The government of Vladimir, Viaz-nikovski district, is known for its fine crops of cherries; the best of these, *r o d i t e l e v a*, is demanded in great quantities at the distilleries; some localities of the district of Mourom, government of Vladimir, cultivate the red currant to a considerable extent. Near Moscow, in the volost of Tsaritsin, Nogatinsk, Troitse-Golenischevsk and Zuzinsk, many apples, raspberry, currants and strawberries are grown. Some parts of the districts of Bronnitsk, Kolomensk, and Podolsk are renowned for their fruit orchards. The town of Kolomna fabricates the well-known apple jelly cakes called *p a s t i l l a*. The town of Rzhev of the government of Tver, produces in great quantities apples, syrup and young trees; and in the town of Torzhok, apples, berry bushes and cherries are cultivated in sheds. The town of Maloyaroslavets, government of Kalouga, grows many cherries, and the inhabitants of Borovsk, same government, cultivate young fruit trees for the trade.

To the south of Moscow the Chernigov and Koursk governments, in the districts of Korochansk and Fatezh, are of great importance in the home fruit trade. In Koursk government, fruit-growing is centralized in the localities where there were forests in which apple and pear trees grew in the wild state; to these trees better sorts were ingrafted; the principal of these localities are the town of Korocha, village Likhaia-Poliania, Koupinskaia volost, district of Korochansk. The government of Koursk sends off to different localities great quantities of dried common pears, which being scalded serve for food and for the preparation of *K v a s*, the favourite beverage of the common people; this pear is comparatively cheap, about 1·50 roubles per poud. The town of Koursk, and its environs produces many fruit grafts, which go to different localities.

The government of Poltava, districts of Zenkovsk and Loubeansk, produces many plums, vengherka. These plums are sold in fresh and dried states. The cherries, shpanka, cultivated in Poltava, are celebrated. In the Kharkov government fruit culture has attained great development in the towns of Kharkov, Akhtyrka and Bogodoukhov and in the districts of Starobelsk, Zmievsk, Valkovsk, and Lebedinsk. In the government of Voronezh apple and cherry orchards, cultivated by estate owners, town inhabitants and peasants, have a great trade importance. The town of Voronezh sends great quantities of apples to Moscow, and the principal fruit gardens are in the village Perlevka, district of Zemliansk, in Khokhlatsk, Trostianka and Oukolovo, district of Ostrogozhsk.

In the east of Russia, fruit culture has greatly developed on the border of the Volga, especially on its right high bank, and along the rivers which fall into it; also in the governments of Saratov, Simbirsk and Kazan. Fruit gardens are much cultivated in Doubovka, Zolotoe, Sarepta and in the environs of Kamyshin, Saratov, Volsk and Khvalinsk. The districts of Kourmish, government of Simbirsk, Sviazhsk and Tetush, government of Kazan, produce quantities of apples, which go by the river Kama to Siberia.

The climate of nearly all the localities mentioned above is not very favourable to fruit culture. Therefore this industry has developed more in the south-west of European Russia, for example in the governments of Kiev, Podolsk, Bessarabia, and in the western half of the government of Kherson. In the latter government alone, where the conditions for fruit culture are less favourable, about 50,000 dessiatines are under orchard; and where fruit culture is the most developed in the villages near rivers, especially near Dniester in the environs of the towns Odessa, Nicolaev, and Kherson, where apricots, peaches, plums, cherries, walnuts, medlars, apples and pears are raised. Apricots are shipped to the north in great quantities.

The governments of Podolsk and Bessarabia have a still softer climate and produce for the trade principally plums and grapes. Dried plums, or prunes, from Bessarabia go over all Russia. Prune-drying is centralized in the districts of Kishinev and Khotinsk, government of Bessarabia, where more than 330,000 pouds of prunes are prepared, and in the district of Oushitsk, government of Podolsk, which ships abroad yearly more than 300,000 pouds of prunes. In the government of Bessarabia more than 70,000 dessiatines are under orchard in which are planted more than 4,130,000 fruit trees, 377,000 fruit shrubs and about 35,500,000 fruit vines.

The Crimea is of the greatest importance for fruit culture, and especially the southern part of it, situated to the south of Simpheropol, where the climate is quite favourable for the culture of the most tender species. Crimean fruit competes successfully with fruit brought from abroad, and being highly prized, it compensates for the labour, knowledge and capital spent in its cultivation. The orchards in Crimea, situated on the large and small rivers, and on the northern and southern descents of the Crimean mountains, bear apples (sinape), and the delicate French varieties of pears, plums, walnuts, cherries and smaller quantities of medlars, quinces, apricots, peaches, almonds, chestnuts, figs and pistachios. Fruit gardening continues to develop greatly, owing to the increase of the population and capital. The great foes to fruit gardening are the numerous noxious insects, and storms which happen almost yearly about August and knock down the fruit from the trees; the vines are less influenced by these enemies, and therefore they flourish best.

As to fruit-growing in the Caucasus it should be noted that the climate varies considerably in different localities. The western part of the Caucasus, lying near the Black Sea, has the same climate as the southern border of the Crimea; its eastern part serves as passage for the hot districts of Asia. Both of these parts of the Caucasus differ much from each other, especially by the quantity of atmospheric precipitation, which is much greater in the west Caucasus than in the east. In temperature both these parts of the Caucasus vary in different localities, ranging all the way from the moderate to the very hottest. There are localities in the Caucasus, where grapes, peaches and figs grow in a practically wild state. Fruit culture has developed in the Caucasus in consequence of the above-mentioned circumstances. Owing to the sparse population, the want of ways of communication, of knowledge, and of spirit of enterprise in the population, fruit culture in the Caucasus has no great trade importance, and only viticulture has developed to a great extent as a trade industry.

The different conditions under which fruit is grown in various localities of Russia could not but influence the means of its cultivation. Owing to the sparse population and the comparatively low prices for land, fruit culture is in general rather extensive in Russia. The principal fruit trees, apple and pear, and in some localities plums and cherries, are cultivated in their natural forms. It often happens that fruit gardens are laid out on areas occupied by forests of wild apple and pear trees, by ingrafting branches of cultivated fruits to the wild trees. These orchards, called *levada*, present a strange plantation in which fruit trees are intermixed with other species. To such orchards, *levada*, belong also the little forests of wild cherries, which are generally situated on elevated steppes, only a little cleaned by gardeners and surrounded by hedges, and the cherry and plum orchards, where the trees are especially planted. At the present time the Department of Forestry has made attempts at growing fruit trees on the steppes, in the manner of small forests. Except these *levades*, or small gardens, fruit trees are grown on extensive areas. The trees are then planted in rows, and the spaces between the rows are yearly cultivated for sowing annual cereals and vegetables, and in the Crimea, tobacco. Sometimes this practice assists to some extent the retention of moisture in the soil and acts as a substitute for irrigation, without which fruit culture is not possible in the eastern governments, as also in the steppe and southern localities. The soil of fruit orchards is either wholly dug up, or only a space around the trunk of each tree, from half an arsheen to the width of the crown of the tree, is freshened; very often at the same time the soil is manured about the roots.

In the western and south-western regions of the Empire, owing to the abundance of atmospheric precipitation, to the moderate winters and to the natural fertility of the soil, the same rules on fruit culture can be practised as in western Europe. But further to the north-east the climate is drier, the winters more severe, the heat in summer more intense, the frosts early in spring and late in autumn come more frequently, and moreover the summer dry winds and the northeasters place fruit culture under great risks. Orchards in central and eastern Russia suffer a great deal from the bad climate and even in the course of ten to thirty years they disappear entirely. The trees do not attain their full development, and therefore the growers plant them very close together. In the governments of Saratov and Simbirsk the orchards are always in need of moisture and the owners bring water from springs and streams by pumps, gravity, by weirs or *chigir*, or else lay the gardens out on sloping grounds that can be irrigated from neighbouring streams;

such slopes however are mostly disposed to unfavourable winds. Such irrigation is also used for orcharding in the southern Chernoziom regions, in the Crimea and in the Caucasus.

The greater part of young trees, called *p r i s a d k i*, are grown by common gardeners, generally on very rich soil, without transplanting or cutting the tops. These growths successfully compete with other young trees, cultivated by the learned horticulturists who take great pains with their work, and who employ the same methods as are practised in Germany. In the eastern parts of Russia, pruning has had the effect of making the young trees more sensitive to the severe frosts. It has been noticed that the cutting of branches near the stem brings disease to the tree; therefore some gardeners never prune their trees close to the trunk, while others do not trim the branches until the trees begin to bear fruit.

Trees generally bear abundantly only every two or three years. Why the fruit tree crop is so irregular has found no satisfactory explanation as yet, the cause being perhaps due to the methods of pruning, perhaps to the methods of planting and cultivation, and perhaps to the soil or climate. The careful watering and nursing of the trees does not seem to remove the difficulty.

The most favourable season for transplanting young fruit trees is the spring, in the northern part of Russia, and in autumn in the southern, because of the severe winters in the former, and the dry summers in the latter regions.

Fruit trees show a great number of species; some are imported, others are varieties long since acclimated, and still others are purely local. However, only a few local varieties, such especially as have attained great trade importance are the most enduring and wide spread. It has been found that new delicate species of fruit are not successfully acclimated in the central governments, as the winters are too severe for them. Other horticulturists claim, however, that many delicate species can be acclimated by cultivating them during long periods; thus, for example, the cherry *m o r e l* grows in the open air in the governments of Novgorod and Pskov, near St. Petersburg. For acclimating a given variety it is ingrafted into the roots of an old tree, so that in case the firsts sprouts freeze, others may grow from the same grafts; the best tree for such ingraftings in the Liberean apple tree, (*phyrus baccata*), which grows over all Russia. The nomenclature of these different sorts is very confused. Russian horticulturists have not yet come to a final conclusion what sorts are to be grown for trade, although it has been decided that the cultivation of different varieties must be limited. The following list shows the kinds of fruit most grown for the market, the Russian species being written in italics:

North Russia, apple trees: winter sorts, *a n t o n o v k a*, *a n i s*, *c a l o i l*, red winter sort, *b o r o v i n k a*; autumn sorts: *t i t o v k a*, brown *a n a n a s* apple; *s k v o z n o i n a l i v*, *s h e r o p a i*; summer species: *t r a n s p a r e n t* white, yellow, green, red, *a r k a d*, *a v e n a r i u s*, sweet *m i r o n*.

Central Russia; apple trees, except those mentioned in the north Russia list: winter sorts, *s e r i n k a*, good peasant, *c h e r n o e d e r e v o*, English pippin, *r e n n e t* Oberdick, *b o i k i n*, *r e p k a*, winter *g r o u s h o v k a*, red *c a l v i l*; autumn varieties; red *a n a n a s*, *a l e x a n d r o v s k*, large *a p o r t*, (Emperor Alexander), *p i p k a*, *b r o w n*, *k o r o b o v k a*, red autumn *c a l v i l*, *r e v e l s k* *g o l o u b i n o e*, *s t k l i a n k a* *R e v a l*, *m a l i n o v o e*, red autumn *v i n n o e*, *m i r o n*; summer sorts: *ts a r s k i* ship, *K h a r l a m o v s k*, *s h a m p a n s k*, *R e v a l* *g r o u s h e v k a*, white summer *c a l v i l*, *z e l e n k a*, *R e v a l* *b o r s d o r f*, red *a s t r a k a h a n*. Pears: winter-*m a s l i n a* *L i g e l i a*; autumn *b e z s e m i a n k a*, red *b e r g a m o t*, *s a p e z h a n k a*, *v i n e v k a*

sloutskia, limonnaia, dobrí khristianin William, bera sloutskia; summer tonkovetka, summer bergamot, spasovka, green vinnaiia.

Plums: blue vengerka, yellow vengerka Hartvis, ordinary renklod, skorospelka, red mirabel, red yaichnaiia, white ochakovsk. Cherries: vladimirsk, early morel, lontovka dutch morel.

South Russia, except those above mentioned, Apples: winter sorts, crimean sinap, goloubok tirolsk, gold parmen, red stettin, zigankia from Dniester; autumn sorts; tsellini, domneshst, shafran; summer, white astrakhan. Pears: winter sorts, forel, winter sylvester, masliania dilia, masliania gardenpot, autumn sorts; panna, fondant de bois, mikhailovsk, masliania apremont, duchesse, red dekanka, autumn koloma; summer sorts; sakharnia, baba fantovaia, sapezhonka, illinka, white summer maslenia; Plums: yellow apricot, vengerka, damask, mozheron. Cherries: shpanka, ostheim veiksel. The following varieties are the best adapted to the suburbs of Vladikavkas, North Caucasus: apple trees: Reine de Renette, Calville, President Lincoln, Belle-flor-john; pear trees: black alagir nelisse d'hiver and Beret d'Arenberg.

It is impossible to give the exact figures concerning the size of the fruit crop; in general it does not suffice for the demands of the population, and therefore much fruit is imported. On the markets all sorts of fruit find a ready sale, beginning with those that fall from the trees before the regular gathering, the forest fruit, and ending with the highest dessert varieties. Apples, pears, and cherries are generally sold in the fresh state, although considerable quantities are also prepared for preserves, and are boiled, dried or pickled, as the case may be. The method of drying fruit by the fire, with the exception of plums, is as yet little known in the above-mentioned districts, chiefly because of the scarcity of cheap raw material.

The greatest part of fruit gathered is consumed by the population in the course of the summer and only a few winter varieties of apples and pears remain fresh till spring. A very numerous class of dealers and lessees are occupied with this industry; they lease personally or through agents whole orchards and gardens, generally by the year. The contracts are drawn as a rule at budding time; judging by the buds on the trees the lessee calculates the amount of the crop and defines accordingly his price. He undertakes to take care of the fruit, to gather and sell it, whereas the proprietor, or lessor, of the orchard has to cultivate the garden before and after the crop. Small dealers sell the fruit to the local population or in bulk to large dealers from the towns. The packing of fruit is variously done according to local means and the value of the fruit. Fruit on the principal markets in Moscow and St. Petersburg is stored in cellars, is assorted there and set for sale, not unfrequently under wrong names. Of apples the greatest demand is for those called antonovka, used in cooking and in confectioneries; for dessert in winter, in large towns Crimean apples sinap-candyl and sari-sinap are generally used.

The operations of the exterior trade of Russia as regards orchard and garden products can be seen from the following figures. In the last four years Russia imported fruit as follows.

I m p o r t s .		1887.	1888.	1889.	1890.
All sorts of vegetables . . . . .	{ Pounds. Roubles.	352,428 480,532	180,205 275,875	392,490 559,518	340,104 380,401
Salted vegetables . . . . .	{ Pounds.	2,28	1,739	2,356	2,869
Pickled and pressed . . . . .	{ Roubles.	8,675	9,156	13,142	20,306
Fruit and berries fresh salted and pickled. . . . .	{ Pounds. Roubles.	93,417 379,652	99,023 401,375	72,266 264,590	80,104 434,608
Oranges and lemons fresh . . . . .	{ Pounds. Roubles.	1,283,362 2,931,688	1,145,179 2,397,699	1,595,002 3,255,399	1,388,664 2,778,735
Fresh grapes . . . . .	{ Pounds. Roubles.	38,926 171,329	30,715 86,725	32,009 111,858	36,595 102,979
Olives all sorts, dried, salted and with oil . . . . .	{ Pounds. Roubles.	62,215 210,198	68,865 226,462	94,780 289,636	110,433 316,938
Turkish locusts . . . . .	{ Pounds. Roubles.	252,584 271,360	212,709 242,871	238,398 278,581	227,173 266,234
Nuts . . . . .	{ Pounds. Roubles.	275,002 749,983	367,342 965,807	432,507 998,622	406,025 893,372
Almonds and pistachios . . . . .	{ Pounds. Roubles.	107,594 890,690	133,900 1,141,613	104,545 887,964	115,150 882,648
Apples and pears . . . . .	{ Pounds. Roubles.	87,075 346,254	125,645 483,677	156,310 548,937	103,209 369,845
Dates, raisins and other dried fruit . . . . .	{ Pounds. Roubles.	1,081,189 2,437,156	1,308,692 2,823,090	1,596,344 3,303,605	1,409,934 2,936,279

The export of vegetables and fruit, for the five years, as seen in the following table, was not great.

Years.	V e g e t a b l e s .				F r u i t .			
	Fresh, dried and pressed.		Fresh, dried, salted and pickled.		Fresh, salted and pickled.		All sorts of dried fruit.	
	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.
1887	—	68,695	138,125	320,467	40,770	50,566	23,372	45,653
1888	271,007	142,840	239,700	301,019	39,885	64,507	36,381	88,716
1889	356,361	109,261	45,461	89,562	38,313	51,522	103,703	148,953
1890	295,504	325,873	95,266	169,231	33,453	80,171	298,175	1,092,665(?)
1891	489,212	177,567	55,940	75,057	70,582	75,582	98,892	264,261

#### VITICULTURE AND THE WINE INDUSTRY.

The cultivation of the grape represents one of the principal branches of agriculture in southern Russia and the Caucasus, chiefly in Transcaucasia, where viticulture was known in ancient times, and where, as for example at the southern foot of Caucasian

Mountains, in the valley of the river Rion till the present day, examples of gigantic grape vines (*vitis vinifera*), are found growing wild.

The northern boundary for the cultivation of the wine grape in Europeau Russia runs as follows: from Mogilev on the river Dniester  $48^{\circ}27'$  N., it passes to Schpola, government of Kiev,  $49^{\circ}$  N., Alexndrovsk on the river Dnieper, Ekaterinoslav about  $48^{\circ}27'$  N., Piatiisbinskaia Stanitza, Don,  $48^{\circ}35'$  N., crosses the Volga near Sarepta,  $47^{\circ}31'$  N., and descends on the east to the mouth of the river Ural. Thus the northern boundary of the wine industry in European Russia hugs latitude  $49^{\circ}$  N., and coincides approximately with the May and September isothermal line,  $+16^{\circ}$  Celsius. Wild grape vines are met with also in the following extreme points in the north: on the shores of Prut, Bug, Dniester and Dnieper, on the isle Khortitsa, somewhat to the south from  $48^{\circ}$  N. The northern boundary of the grape region in Asiatic Russia passes through the Syr-Darya and Semirethinsk districts and ends in the Amour domains, where a special variety of it prospers, the so-called *vitis amurensis*; it supports long and severe winters, and is successfully cultivated even in St. Petersburg, but does not produce an edible fruit.

As to edible grapes, the boundary of the localities, where such grapes are cultivated, passes through the southern part of the government of the Vistula and Minsk, then southward from Chernigov towards Koursk, Voronezh and Borisoglebsk and ends in the Urals to the north of Gouriev; however some early varieties grow much farther north, on the latitude of Riazhsk, government of Riazan, Volsk on the Volga, even in Riga and quite near to St. Petersburg. In the latter-named localities grapes are cultivated on espaliers, along walls, looking to the south, and demand great care.

Viticulture is the most developed in the Caucasus, Bessarabia and the Crimea and grapes are less grown for wine in Turkestan, the regions of Don, and still less in the governments of Kherson, Podolsk, Astrakhan, Ekaterinoslav and the regions of the Ural, where the industry occupies an insignificant place among the other occupations of the country people, and in some parts only amateurs are engaged in the manufacture of the wine. Elevated areas under grape are very extensive in Russia: thus in Bessarabia, there are vineyards situated 1,160 feet above the sea level; in Turkestan they are 2,340 feet, and in some localities of the Transcaucasus grapes ripen at the height of 4,500 feet above the sea level. As there are no statistics concerning grape culture and the quantity of wine manufactured in Russia, the following figures are taken from the most trustworthy sources possible, to show approximately the dimensions of the vine crop and the quantity of wine produced in the Empire. The Caucasus mountains divide the principal vineyard region of Russia into two parts, the Caucasus and the Transcaucasus. The first consists of the Kouban and Tersk district and the government of Stavropol; and the second, of the region of the Black Sea, the governments of Koutais, Tiflis, Elisavetpol, Eriwan, Bakou, and the Kars and Dagestan district.

In the Kouban district there are 500 dessiatines under vineyards, of which only 25,000 vedros of wine are produced, as only 30 per cent of the grapes are used for wine; the remainder being consumed in the fresh state. The soil under vineyards is sandy, in some parts alluvial, clayey and slymy; and in the steppes, generally sand and Chernoziom. Vine cuttings are set in rows; the first two years they are cut close to the earth, the third year, half an arshine above ground, and the fourth year, still higher; the vines are tied up by bast strings to poles and racks. In the Tersk district there are about

15,000 dessiatines under vineyards, which produce yearly about 2,500,000 vedros of wine, the mean harvest being above 350 vedros per dessiatine. Two-thirds of the grape juice is made into spirit. Vineyards are laid out on clayey soil; the vine cuttings are planted in rows in beds and for the winter are covered with earth. The wine prepared in this district is known under the name *kizliar*, as the town of Kizliar is the center of interior wine trade. This wine is principally sold on the Nizhni-Novgorod and southern markets. The area under vineyards in the government of Stavropol is 3,500 dessiatines, which produce 450,000 vedros of wine. The principal center for wine fabrication is the village Praskovea, and hence the wine of Stavropol government is generally called *praskovesk*. The vineyards are covered for the winter with earth.

By summing up the above figures, it may be seen that the total area under vineyards in the North Caucasus in 19,000 dessiatines, which give about 2,975,000 vedros of wine. In the Transcaucasus the first place of prominence as to viticulture was recently occupied by the government of Koutais, in the seven districts of which 35,000 dessiatines were under grape, producing yearly 5,000,000 vedros of wine. But owing to the development of the phylloxera and different diseases of the vine, the area of vineyards and the quantity of wine produced, decrease yearly, and now the most important vine-growing region is the government of Tiflis. The last data show that in the government of Koutais there are now only 28,000 dessiatines under grape, producing 4,250,000 vedros of wine yearly. In this government 60 per cent of the vines are *magliari*, that is, vineyards where the vine is allowed to climb along trees, and 40 per cent are called *dablar*, or vineyards where the vines are tied to poles. The soil is limy and clayey, and in some parts, sand-clayey. The best wine is called *svirsk*, taking its name from the village Svir.

In the districts of Batoum and Artwin, government of Koutais, the grape grows wild, and is cultivated wherever the height of the locality and the steepness of the mountains in grape regions do not make cultivation impossible. There are no data showing the area under vineyards, nor the quantity of wine, produced in these two districts. In the district of Batoum the vine generally climbs the trees; in that of Artvin it is cut and tied to poles. The vineyards in the regions of the Black Sea and Soukhoum, adjacent to the government of Koutais, occupy an area of 1,800 dessiatines and produce 80,000 vedros of wine. The soil under the vineyards is principally clayey, in some parts, black-earth, clayey or sand-clayey. In the government of Tiflis, to which also belongs the Cahetie, known for its wine of high quality, there are 50,000 dessiatines under vineyards, producing yearly about 4,000,000 vedros of wine. The principal centers of viticulture are the following villages, on the borders of the river Alazan in Cahetie,—Tsinondaly, Kardanakh, Moukouzan and Moukhran. The soil is for the most part black-earth and clay; the subsoil consist of yellow and gray lime. Vine twigs are planted in regular or mixed rows and are tied to poles.

In the government of Elisavetpol, in which the centres for wine fabrication are the German colonies, Elenendorf and Ekaterinenfeld, there are 7,000 dessiatines under grape which produce yearly 650,000 vedros of wine. The best wine are the red varieties. The soil is various: black-earth, clay, lime and sand. In the government of Erivan viticulture is developed in five districts, in which at the present time there are 12,800 vineyards, occupying an area of 7,700 dessiatines and producing yearly 300,000 vedros of wine. The vine dressers and the wine manufacturers are exclusively Armenians; the

Tartars, who own vineyards, sell their grapes in the fresh state or prepare candy, and all sorts of beverage from them. The vine shoots are cut very low; for winter they are covered with earth, and in summer watered from two to five times. The principal centers of wine manufacture are the town of Erivan, the villages, Ashtarak and Vagarshapat, together with Echmiadzin, residence of the Catholicos, high patriarch of the Armenians. The white sorts of the Erivan wine are very strong, 15 to 16 degrees the strongest wine in Russia. The soil is lime-sandy, and clayey, limy and stony.

The area under grape in the government of Bakou is 3,000 dessiatines, which produce yearly 300,000 vedros. The best wine comes from the vineyard Matross. The soil is clay, black-earth, sand and lime. In the district of Zakataly there are 700 dessiatines in vineyards, producing on the average about 175,000 vedros of wine. The soil is lime-sandy. The vines are set in rows and tied to poles. The area under vineyards, in the south-eastern and south-western Kars district, where vine is cultivated principally by Armenians, is not known, as also the quantity of wine produced. In the district of Dagestan, where the center of this industry is the town of Derbent, the area in vineyards attains 3,500 dessiatines, producing 250,000 vedros of wine. As the population there embraces the Islam religion, which has some restrictions concerning the drinking of wine, only one-third of the grape is used for wine fabrication, two-thirds being consumed in the fresh state, and in the manufacture of different beverages and candies. The soil is sandy with much lime in it, and in some places it is altogether sandy. The vine is planted in regularly made trenches; the vine sprouts are not cut during the first year; in the second year, after they have been tied to poles, they are cut for the winter and covered with earth. This manner of cultivation is practised in the northern part of the district; and in the south the vines remain uncovered during winter.

On the whole there are 103,500 dessiatines under vineyards in the Transcaucasus, and 10,250,000 vedros of wine are yearly produced. Thus, the whole of the Caucasus have 120,000 dessiatines under grape, which produce about 13,000,000 vedros of wine.

In Bessarabia, where vine is cultivated from ancient times, even in the second and third century before Christ, there are 70,000 dessiatines in vineyard, which produce yearly more than 12,000,000 vedros of wine. This wine is of a considerably lower quality and is sold as cheap as 20 kopecks to one rouble per vedro. The vines are cut, sometimes shorter and sometimes longer, and in the north and in central Bessarabia they are covered for the winter with earth; in the south they remain uncovered. The average harvest of the vineyards, in the whole government of Bessarabia, is 175 vedros of wine per dessiatine, the minimum being 100 and the maximum 1,000 vedros. The soil is for the greater part sand and black-earth, with a sandy subsoil, sometimes clay and black-earth, with a clayey subsoil; in some localities, in the Akkermann district, the soil is exclusively sandy.

The vineyards in the Crimea, government of the Tauride, occupy an area of 7,800 dessiatines, which produce yearly more than 1,500,000 vedros of wine. The vineyards, situated on the southern rocky border of the Crimea, where the soil is of clay-slate, produce wine of such good quality that it is celebrated not only over all Russia, but also abroad. The best Crimean wines of the southern border are comparatively very dear. Thus, while the ordinary Crimean wine was sold from 2 to 3 roubles per vedro, the average price for the southern Crimean wine was 6 roubles. Of the total quantity of wine produced in the Crimea, 90 per cent is sold in other portions of Russia, or exported,

and 10 per cent consumed in Crimea itself. The central cultivation of the cheap grades of wine is in the Soudak valley. The vine, after being cut by the system of Guyot, is covered for the winter, in some parts of the peninsula, as in the government of Simferopol and Evpatoria; on the southern border it is not covered. The average vine harvest in the Crimea is on the southern border from 100 to 150 vedros, and in the other parts of the peninsula from 200 to 300 vedros per dessiatine. In the Crimea the vineyards contain only the vine, but in Bessarabia, Transcaucasus and other localities it is cultivated together with fruit trees and berry bushes.

Grape-growing in Turkestan has existed from ancient years. The areas, occupied by this industry, are 2,740 dessiatines in the Syr-Daria district, in the Fergansk, 10,550 dessiatines, in Samarkand, 6,400 dessiatines and in the Transcaspian, about 100 dessiatines. The fruit is used partly in the fresh state and partly serves for preparing raisins and treakle; about 50,000 vedros of wine are produced. In the region of the Don there are about 2,440 dessiatines under grape, which produce yearly about 300,000 vedros of wine, sold generally from 1 to 2 roubles per vedro. The greater part of the Don wines are manufactured into sparkling beverages, which are abundantly sold; the wine sold and prized the most is the so-called *tsimliansk*. In some places the vines are trained bow-shaped, that is, they are tied down in the shape of a bow; and in others they are tied to espaliers. The soil under vine varies considerably in quality; the clayey mixed with Chernoziom predominates; in some parts it is compact, in others light. The principal centers for the wine manufacture are the *stanitza* (Cossack's village) Tsimliansk and Razdorsk. In the government of Kherson there are 3,500 dessiatines under grape, producing yearly more than 500,000 vedros of wine; in the government of Podolsk, 400 dessiatines and 60,000 vedros are yearly produced; in the government of Ekaterinoslav about 100 dessiatines, and about 10,000 vedros of wine produced.

In the southern part of the Astrakhan government vine began to be cultivated at the end of the sixteenth century. The areas under grape, according to some data, are estimated at 100, and according to others, 1,000 dessiatines, which produce yearly 10,000 vedros of wine. The bulk of the crop is sold in the fresh state in the governments of the Volga, or is sent to Moscow and St. Petersburg. The vineyards, abundantly watered from the Volga, are principally situated on small hillocks; the vines, which are covered with earth during winter, are set in parallel furrows and form covered alleys. The vine is also cultivated in Sarepta, government of Saratov, where 130 dessiatines are in vineyard. By summing up all these totals it will be seen that in Russia, 225,000 dessiatines are under grape and 28,000,000 vedros of wine are produced yearly.

In visiting the Russian vineyards it is easy to see that in the Caucasus, Bessarabia and the Crimea the soil and climate are so favourable for vine culture, that its area could be ten times increased, and that consequently the quantity of wine produced could be augmented tenfold. But unfortunately viticulture develops very slowly; however, during late years the interest therein has increased, notwithstanding the development of many vine diseases and of the phylloxera. The phylloxera, (*phylloxera vastatrix*) was observed for the first time in the Crimea in 1879; a year later it was found in the Caucasus, near Soukhoum, and in 1886, it was found in Bessarabia. In all these vineyards the radical method for struggling against it was used and during the last two or three years, since the insect has developed itself to a great extent in Bessarabia and in the government of Koutais, the methods of treating the vineyards with sulphurous carbon

and sulphureted Kali carbonicum have been introduced. In Bessarabia the phylloxera develops slowly, but in the Caucasus since 1889 it has made great progress. In 1892 in Sakar, government of Koutais, was founded the first nursery for the culture of the American vine, grown from seed. During the last three years the Government has given yearly 200,000 roubles for fighting the phylloxera; the struggle against this pest, as well as against the other enemies of viticulture, is confided to the Odessa Phyloxera Commission, with Bessarabia in its region, and to the Phylloxera Committees of the Caucasus and the Crimea. Without mentioning the other vine enemies of the animal kingdom, it should be noted that there are many in the vegetable world as well, which have developed themselves in nearly all vineyards and which cause great damage. Such are the diseases mildew, caused by the mushroom *peronospora viticola*, and also *erysiphe Tuckeri*, *sphaeloma ampelinum*, and others.

In examining the vineyards in Russia, it can be seen that the vine in many localities, such as on the southern border of the Crimea, in Cahetie, Erivan, Ashtarak and others, is cultivated with great care, while thus much cannot be said of wine manufacture itself, as that branch of industry is far from being in a satisfactory condition.

Russia cultivates so many varieties of grape that it is impossible to enumerate them, so much the more as there is no ample description of many of the species. It is the custom in Russia to cultivate together different sorts of grapes, local and foreign, on small areas, and in wine manufacture to mix their juices. Therefore, in the most of the regions devoted to the wine industry, there are no especial varieties of wine, although the grape, both the local and imported, are of very good quality. Thus, the comparatively low quality of the Russian wine is principally caused by the admixture of the different kinds of grape, the quality of each individual sort not being alike from year to year. A second cause for the low quality of wine is due to its imperfect methods of manufacture and to the unscientific care of the wine. Wine manufacture in Russia, except perhaps on the southern border of the Crimea and some parts of the Caucasus and Bessarabia, is of a very primitive character, although the grape is, for the most part, of very high quality. It is noted above that the Crimean wine has acquired a high reputation both in Russia and abroad; the same can be said of the Cahetie wines, which are no less renowned than the Crimean, although the two sorts differ greatly from each other. The wine of the Cahetie, containing a great quantity of the extract and colouring materials, have not that delicacy that characterises the wine of southern Crimea, due principally to the well organized cellars. In the Cahetie, government of Tiflis, wine is till now prepared in *karasi*, earthen pitchers, containing from 20 to 50 vedros of wine. However, lately in the cellars of the Department of Apanages, which have bought the best vineyards in Tsinondali and Moukouzani, and also in those of Count Sheremetiev, who owns excellent vineyards in Kardani, wine is manufactured in the same manner as abroad, that is, after the most scientific and practical methods. It should be observed, however, that in Erivan, barrels are more used at present than *karasi*. In Cahetie, wine ferments in earthen pitchers, buried in the earth, and in Erivan they remain on the ground. *Roumbi* (oxskin) and *tiki* (goat skin), used for transporting and keeping wine, are also going out of date.

To give an idea of the composition of Russian wine, chemical analyses have been made, partly by the author of this article, and partly by other chemists, the data of these analyses are given in the following table:

I. Analysis of the natural Caucasus wine, by Tairov.

No. of wine.	Specific gravity.	Extract.	Alcohol.	Mineral salts, ash.	Free acids enumerated $C_2H_6O_6$ .	Volatile acids enumerated $C_2H_6O_2$ .	Bound acids.	Wine stone.	Glycerine.	Sulphuric acid.	Chloroform.	Natron.	Lime.	Magnesium.	Sugar.	Polarization.	
1	0.9908	10.88	2.25	0.24	0.600	0.372	0.182	0.058	0.017	0.80	0.019	0.029	0.009	0.084	0.011	0.013	-
2	0.9955	10.72	2.90	0.18	0.435	0.330	0.084	0.134	0.024	0.85	0.006	0.041	0.006	0.117	0.011	0.007	0.013
3	0.9922	9.63	2.13	0.18	0.510	0.456	0.043	0.152	0.039	0.72	0.013	0.033	0.007	0.098	0.012	0.010	0.011
4	0.9920	11.80	2.71	0.35	0.375	0.297	0.062	0.058	0.017	0.83	0.019	0.049	0.007	0.118	0.015	0.006	0.013
5	0.9916	9.51	1.85	0.30	0.472	0.385	0.070	0.077	0.024	0.69	0.014	0.034	0.006	0.136	0.013	0.010	0.014
6	0.9948	10.46	2.76	0.32	0.427	0.355	0.058	0.134	0.032	0.89	0.008	0.060	0.009	0.131	0.009	0.008	0.015
7	0.9961	11.67	3.15	0.27	0.457	0.367	0.080	0.171	0.032	0.95	0.007	0.045	0.007	0.137	0.009	0.009	0.023
8	0.9928	8.95	1.96	0.26	0.457	0.364	0.074	0.115	0.024	0.68	0.014	0.020	0.005	0.128	0.012	0.011	0.013

II. Analysis of the natural Caucasus wine.

No. of wine.	Specific gravity.	Alcohol.	Extract at 100 degrees.	Extract in vacuo.	Mineral salts, ash.	Free acids enumerated $C_2H_6O_6$ .	Bound acids.	Wine stone.	Glycerine.	Sulphuric acid.	Tannin and colouring substances.	Polarization.
9	0.9936	9.75	2.45	0.31	0.493	0.402	0.073	0.087	0.76	0.011	0.015	-
10	0.9939	11.58	2.78	0.20	0.517	0.387	0.104	0.073	1.03	0.015	-	- 0.2
11	0.9937	11.74	2.68	0.21	0.464	0.348	0.094	0.096	1.00	0.010	0.008	- 0.1
12	0.9927	9.16	2.10	0.24	0.630	0.432	0.079	0.122	0.70	0.012	-	0
13	0.9943	9.82	2.16	0.25	0.503	0.480	0.149	0.149	0.80	0.010	0.008	-
14	0.9940	9.42	2.11	0.24	0.584	0.490	0.076	0.138	0.75	0.008	0.010	0.57
15	0.9959	10.16	2.99	0.27	0.505	0.401	0.053	0.134	1.01	0.009	0.009	0.66
16	0.9964	10.60	2.94	0.27	0.558	0.436	0.098	0.135	0.99	0.012	0.012	0.51

## III. Results of analysis of Russian wine, after data given by Solomon.

	Alcohol extent in per cents.	General acidity; per cent of the wine acid.	Dry residue in per cents.	Average.	Maximum.	Minimum.	Average per cent of glycerine.	Average per cent of Tannin.	Average per cent of volatile acid.	Average per cent of succinic acid.	Average per cent of azote.	Average per cent of ash.
<b>I. CRIMEAN WINE.</b>												
<i>1. South Border.</i>												
a. Red wine . . .	0·9939	10·76	14·82	13·30	10·71	0·350	0·735	0·621	2·765	3·080	2·761	0·638
b. White wine . . .	0·9927	11·93	16·93	14·85	11·86	0·322	0·642	0·492	1·353	4·515	2·569	0·589
c. Dessert wine . . .	1·040	10·53	15·29	12·92	11·03	0·330	0·732	0·493	10·700	21·580	14·925	0·232
<i>2. Valleys.</i>												
a. Red wine . . .	0·9964	10·31	11·94	11·19	8·93	0·580	0·720	0·638	1·569	3·490	2·409	0·324
b. White » . . .	0·9939	9·08	14·61	11·88	9·54	0·525	0·854	0·616	1·773	3·400	2·317	0·510
c. Dessert » . . .	1·0390	—	—	15·33	12·14	—	—	0·567	—	5·540	0·505	3·234
<b>II. BESSARABIA WINE.</b>												
a. Red. . . . .	0·9941	8·24	13·15	11·20	8·79	0·315	0·796	0·544	1·826	3·120	2·266	0·329
b. White . . . . .	0·9922	10·08	12·47	11·61	9·47	0·407	0·662	0·577	1·812	2·154	1·614	0·437
<b>III. DON WINE.</b>												
a. Red. . . . .	1·278	—	—	8·06	5·02	—	—	0·340	—	—	8·333	0·250
b. White . . . . .	1·051	—	—	9·65	7·30	—	—	0·525	—	1·640	0·312	8·260
<b>IV. CAUCASUS WINE.</b>												
a. Red . . . . .	0·9962	7·80	14·99	11·92	9·04	0·388	0·602	0·484	2·028	3·299	2·745	0·449
b. White . . . . .	0·9953	12·45	14·51	13·18	10·43	0·326	0·497	0·414	2·290	3·841	2·977	0·519

The following sorts of wine were analysed:

A. WHITE WINE.

1. Cahetie, 3 years old, light yellow wine.
- 2, 3, 9, 10, 11 and 12, Cahetie, 2 years old, dark yellow wine.
4. Erivan, 3 years old, yellow of the town vineyards.
5. Erivan, 3 years old, light yellow of the neighbouring village vineyards.

B. RED WINE.

6, 7, 13 and 14, Cahetie, 2 years old, bright red wine. 15. Cahetie, 3 years old, bright red wine. 8. Erivan, 2 years old, bright red wine from the neighbouring villages. By examining the data of the three succeeding tables, it will be seen that the figures showing the chemical composition of the Russian natural wine, are the same as those of foreign manufacture. By examining more closely wine manufacturing in Russia, the conclusion may be drawn that the time is not far distant when Russian wine will acquire an exclusive position not only on the home but even on the foreign markets, the more so as the Government has lately offered some measures, intended to develop viticulture, to improve the methods of wine manufacture and to increase the wine trade.

The following table shows the import of foreign wine during 1887 to 1891.

Years.	Different grape wine imported in barrels.		Grape wine non-sparkling imported in bottles.		Different sparkling grape wine imported in bottles.	
	Pounds.	Price in roubles.	Bottles.	Price in roubles.	Bottles.	Price in roubles.
1887	493,698	5,606,284	190,355	280,324	452,665	1,611,923
1888	479,494	5,642,810	172,382	282,049	433,070	1,464,491
1889	514,403	4,593,574	206,407	309,125	448,491	1,588,872
1890	517,541	5,092,798	193,313	273,241	556,030	2,055,462
1891	513,655	5,755,497	182,042	262,273	499,865	1,568,216

Thus the import of foreign wine has not decreased during the latter years, notwithstanding the development of wine manufacture in Russia itself. By comparing the price of the yearly import of a longer period, it will be noticed that the price has decreased during recent years.

Years.	Price in roubles.	Years.	Price in roubles.
1882 . . .	14,238,554	1887	7,499,531
1883 . . .	17,749,440	1888	7,389,350
1884 . . .	19,082,276	1889	7,471,570
1885 . . .	10,442,101	1890	7,421,501
1886 . . .	8,437,800	1891	7,585,986

The greatest quantity of wine Russia imports from France, Germany, Greece, Austria, Great Britain and Spain.

The export of Russian wine is as yet insignificant, as may be seen from the following table. From 1887 to 1891 Russia has exported as shown below.

Years.	Wine in barrels.		Non-sparkling wine in bottles.		Sparkling wine in bottles.	
	Pounds.	Price in roubles.	Bottles.	Price in roubles.	Bottles.	Price in roubles.
1887	—	106,578	157,442	78,521	3,594	11,168
1888	18,585	84,458	147,501	99,250	888	1,784
1889	13,636	82,475	169,954	117,169	1,106	2,774
1890	21,540	125,338	—	48,954	5,845	13,210
1891	14,294	72,898	—	94,998	7,362	15,439

Thus, the character of the export of Russian wine is as yet not defined. But still, notwithstanding the variability in the yearly export, the total amount sent abroad gradually increases.

## CHAPTER X.

**Live stock.**

Breeding and raising of live stock; large-horned cattle; horses, sheep and pigs; cattle trade, dairy industry, bird-raising, bee culture, meat and wool.

**T**HE raising of live stock constitutes a very important branch of farming in Russia. It is sometimes intimately related to agriculture, and sometimes it is an independent and exclusive occupation of the peasant. In the western part of European Russia it is especially associated with the different branches of farming. The dense population, the high development of agriculture requiring great quantities of manure, and the ready sale of the animals, cause the peasants of that region to pay great attention to their stock. In respect to the proportion of animals bred and to the amount of feed required per year the western region of European Russia differs very little from the neighbouring countries of Western Europe.

In the north-western governments, in the Baltic provinces and in Finland, the most important branches of the industry is the dairy and the fattening of cattle for slaughter. Less attention is paid to the breeding of horses, sheep and pigs. In the Vistula and western governments dairy and swine breeding are the most profitable branches of the live stock industry. In the south-eastern governments and in Bessarabia, work cattle and horses are of great importance; moreover, dairy, sheep breeding for wool, and swine raising are profitable branches of farming.

On the extensive but not fertile area of north-eastern Russia in Europe, the raising of live stock plays a very prominent role in the fertilization of the fields. The peasants, who form the greater part of the landowners of that region, breed large cattle and keep milch cows for their own family needs. The fattening of cattle for the market, although considerably practised, is not very profitable, as the small northern cattle cannot well repay their fodder with their meat. In the localities of the northern region, rich in meadows, and in some extensive villages, milch cows are raised for the purpose of making high grades of butter and cheese. Horses are bred in the north and north-western governments of European Russia exclusively for work purposes, and in such numbers as the local methods of agriculture require. The breeding of sheep and of pigs is of still less importance in these regions.

In the northern and central governments of the Chernoziom region, herding is closely related to agriculture, as the animals furnish manure for the fields and the oxen and horses serve as labourers. If on the one hand the sowing of cereals on a large scale restrain the herding of cattle to some extent during the pasture time, on the

other hand, the abundance of straw, good harvests of bulbous fruits, grass and maize, and also the quantities of residues from distilleries, refineries and other produce-works, permit the profitable breeding of milch cows and the fattening of fine beeves and hogs. In the same region the raising of good trotters and of large draught horses is much developed.

In the southern and south-eastern steppe governments, and also in the districts of the Don, herding is of great importance, owing to the large amount of pasture lands, and to the abundance of straw and hay for winter fodder. Of all the branches of stock farming the most important is the breeding of fine-wool merino sheep, exclusively centralized on rich estates. The peasants of this region, on the contrary, raise only horned cattle. Horse breeding is also centralised in this region, and more especially in the south-eastern governments of European Russia.

For the nomadic and even for the settled inhabitants of Transcaucasia and of the steppes of Central Asia and western Siberia<sup>1</sup> herding is the principal industry, the object of prime necessity and the source of the riches of that people. For the nomads, herding is the exclusive occupation, furnishing every home requirement, for food and for dress, as they eat nothing except milk and meat. By selling extra cattle they procure money for paying taxes, for buying home utensils as well as objects of luxury. The local inhabitants are not only dressed and fed by the herding industry, but they also procure from it material for handiwork, which occupies both men and women during the long winter seasons.

The abundance of pasture lands and the possibility of keeping the stock on green fields during long periods render steppe-herding especially profitable. If in the southern steppe governments of European Russia cattle raising is visibly supplanted by agriculture, in the steppes of the Caucasus, central Asia and western Siberia herding is still the predominant and, in some parts, the exclusive industry of the peasant, owing to the dry and hot summers and the abundance of steppes unsuited to the cultivation of cereals.

The following table will show the quantity of live stock in European Russia, in the Kirghiz steppes and in Siberia.

	In thousands.							
	Horses.	Cattle.	Sheep.	Swine.	Camels.	Goats.	Stags.	Total.
In the 59 governments of European Russia and in the Don districts (1888) . . . .	20,867	27,922	48,220	10,742	26	1,393	263	109,433
In Finland (1889) . . . . .	289	1,268	1,032	186	—	16	72	2,863
In Siberia . . . . .	2,318	2,429	3,017	536	—	117	198	8,615
In Tourgaisk district . . . .	705	383	1,922	—	157	146	—	3,313
In the districts of Semirechensk, Semipalatinsk and Akmolinsk, approximately .	1,756	882	9,711	—	246	—	—	12,595
Total . . . .	25,935	32,884	63,902	11,464	429	1,672	533	136,819

The visible predominance of the village population over that of the town explains the relative richness of Russia in live stock when compared with the number of the inhabitants. On the other hand the low fertility of the soil in many localities of Russia, the considerable area under woodland, bog and marshy plains, the severity of the climate, the necessity of keeping the stock on winter feed during a long period, and many other circumstances which hinder the development of herding, explain why the number of live stock to a given area of land is so small compared to that of other countries of Western Europe, and especially to that of the United States. The same reasons, as also the considerable dimensions of Russian farms, explain the small number of stock relative to the amount of land suitable for herding and tilling.

In the 59 governments and 1 oblast of European Russia the live stock was registered in 1888 as follows:

	Per 100 inhabitants.	Per 100 dessiatines.	Per 100 dessiatines of pasture.	Per 100 dessiatines of ploughed land.
Horses . . . . .	22·9	5·1	11·7	18·2
Large-horned cattle . . . . .	30·6	6·9	15·4	23·1
Sheep . . . . .	52·9	11·9	26·9	44·9
Swine . . . . .	11·8	2·6	6·0	8·7

The maps, Nos. 1 and 2, show the relation between the total of live stock and that of the population as well as that of the area of land in the different governments.

The small number of cattle relative to the area of ploughed land becomes still more considerable if the small weight of Russian stock be taken into consideration. According to data given by the slaughter houses, tallow boileries and meat markets of the principal towns of Russia, the average weight of different stock slaughtered and alive may be thus represented:

For steppe cattle slaughtered, the average weight, together with the fat, 17 pounds 25 pounds.

For the Great Russian cattle slaughtered, average weight, together with the fat, 7 pouds 7 pouds.

For steppe merino sheep slaughtered, average weight, together with the fat, 2 pouds 20 pounds.

For the north sheep slaughtered, average weight together with the fat, 1 poud 10 pounds.

For swine slaughtered, average weight, together with the fat, 7 poud 27 pounds.

For horses, average live weight, is 18 pouds.

In the 50 governments of European Russia for 100 head of field animals there is 20·1 per cent of horses, 25·1 per cent of cattle, 45·4 per cent of sheep and 9·4 per cent of swine. The relation between the different sorts of farm animals is not the same in the several regions and governments of European Russia. In general, it may be said that in northern Russia principally large cattle and horses are raised, and in some governments of southern Russia, sheep and swine. In the steppe regions of south-eastern Russia in Europe, and in the steppes of Asiatic Russia the raising of sheep and of horses predominates. The relative quantity of horses, cattle, sheep and swine to the total number of stock may be seen in the tables 3, 4, 5 and 6.

**TOTAL NUMBER OF CATTLE.**

**Chapter X. Live Stock, Map No. 1**

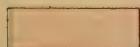
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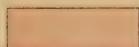
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### Number of large and of small live stock per 100 inhabitants.



Less than 75



75 - 100



100 - 200



200 - 300



300 and more



# TOTAL NUMBER OF CATTLE.

Chapter X. Live Stock Map No. 2.

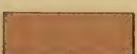
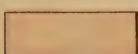
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Number of large and of small live stock per 100 dessiatines of fertile soil.



Less than 20

20 - 40

40 - 60

60 - 80

80 and more



In the development of herding, in every country there are noticeable peculiarities, dependent on the general level of the cultivation of the population and on the position that farming occupies in the country. During the first steps of development, when the people possess great areas of land, they seldom occupy themselves exclusively with the raising of live stock, although that branch of agriculture be the more profitable. With the increase of population, with the improvement of ways of communication and the like, tillage, small at first, is increased, and herding correspondingly decreases, as cultivating land for sowing is much more profitable than using it as pasture. Under such conditions stock is raised in small numbers, usually only sufficient for the needs of the farmer, and for manuring the fields. The area of land under pasture and meadow decreases, and that under cereals increases, as in that period of human development cereals form the principal branch in the rural economy of the country. In such a period the raising of live stock plays a most inferior role; there are scarcely any markets for its produce and, therefore, considerable improvements in the keeping of cattle do not pay. At last, as the population increases and great central markets are organized, the prices of animal products also increase, together with the demands therefor, and consequently the raising of live stock develops. Under such conditions the improved methods become more profitable, the animals are better fed, for which cause meadows and pasture lands increase their areas at the expense of ploughed fields.

All these instances can be observed in Russia at the present time. In the east and south-east, beyond the Volga and in the steppes of Asiatic Russia, herding bears its primitive character. Here the live stock of the nomad, Kirghiz and Kalmucks pass the greater part of the year on the open steppes, remaining three to four months on winter pastures. In spring, in the beginning of March or April, when the snow is scarcely off the ground, the nomadic stock raisers begin to move with their herds to more elevated localities, where grass starts earlier. During the summer the cattle are in the best of condition, fattening on the rich vegetation of the steppes. At the same time the nomads prepare themselves food from the milk of mares, sheep and cows, such as koumis, fermented mares milk, cheese and butter, for the whole year.

The best time for the stock is the beginning of spring and autumn, for when the summer heat sets in, the animals suffer much from hunger and thirst and from insects. At the end of August the herds of the nomads move to winter pastures where they get their food from under the snow. Only the youngest animals are given hay, harvested in very small quantities, and the remainder of the herd is sent from the early morning into the open. In front goes a drove of horses which scatter the snow with their hard hoofs, and thus procure dried steppe grass for themselves and for the cattle that follow. Last of all come the camels, which not being capricious in the choosing of their food eat up whatever remains after the other animals have passed; they cannot get the food themselves from beneath the snow. Such winter pasturing is called by the local inhabitants тебенека. Unfortunately, deep snows and the formation of ice crusts on the surface of the pastures are unsurmountable obstacles for the herds, horses even being under such conditions unable to find food. As the nomads take no trouble to provide the stock with hay for the winter, the cattle often perish from cold and hunger in great numbers.

Notwithstanding the importance that stock raising has for the nomads, they take very little care to avert the dreadful consequences, due to the starving of their herds. The stock of the settled Russian population is much better provided with hay and straw

for the winter, however, even among the Kirghiz a tendency to bettering the methods of stock farming in winter is remarked during recent years. The nomad possesses such a considerable number of animals that it is quite impossible for him unaided to prepare a sufficient quantity of food for them. Wishing to help the roaming population the Administration of the district of Turgaissk now offers to rent scythes to the Kirghiz rangers, which the latter accept with pleasure for harvesting their hay. In the south and south-west, in the Chernoziom region in the localities of the fallow and many-soil land system, stock farming is adapted to definite localities, and special fields are designated for pasture, as cereals are cultivated here to a great extent. Of the stock raised here sheep are the principal, as they repay their food much better than horses and cattle. The pasture period is rather long here, so that the stock comparatively with other localities, are not kept long in stables and on dry fodder and, therefore, the expenses for the building of stables and preparing winter feed are not great.

The facts unfavourably influencing stock farming in the south and south-east of European Russia and in the steppes of Asiatic Russia are the repeated droughts causing poor pasture and loss of the herds from disease, and especially from the plague. Both these misfortunes offer a great drawback to stock raising. It may be said that more cattle perish from hunger than from the plague. Not many years ago from 100 to 400 heads of stock perished from the plague yearly in European Russia alone, but since the publication in 1879 of a law ordering all cattle taken with the plague to be killed forthwith, and that the cattle designated for slaughter be transported by railway, the harm caused by the plague or epizootic has been much limited. Owing to the regulations mentioned and to great sums spent by the Medical Department of the Ministry of the Interior for combatting the plague it now visits only the south-eastern governments of Russia. These favourable results, attained in so short a period, give full hope that in a short time cattle will perish of the plague or murrain only in Asiatic Russia.

Nearer to the north in the three-crop rotation regions, in the central agricultural governments, the number of cattle relative to the population is always decreasing, as there is not enough pasture, the greater amount of the land being under grain crops. Here stock is raised for the greater part, not as a profitable branch of farming but for beasts of burden, for manure, and for supplying the population with the animal products for food. In that region the fodder for the stock is rather poor, the feed usually consisting during the whole winter of only straw and husks, hay being rarely furnished. In summer the pasture lands are also very poor as the stock is fed principally on fallow land, which remains long without cultivation.

Still further to the north, in the non-Chernoziom region, in manufacturing governments with dense population, the greater part of which does not occupy itself with field work, but with different trades or fabrics, stock raising is developed as a business, especially dairies, near the central markets. Cattle are kept here much better than in the preceding region; food, especially hay, is much more abundant, as cereals and other crops are not so generally grown as in the north of the Chernoziom region; in many localities pasture grass is regularly sown. The stock finds sufficient food in wood land pastures and in winter is fed principally on hay and other fodder, not only on rich plantations but even on the farms of the peasants, as now landowners become more and more persuaded, that the good feeding of cattle well pays for the trouble and expense. Except for trade, stock raising has a great significance here for producing manure, as the soil not being

very fertile, would give very small harvests without fertilizing. The period of winter feeding of cattle is very long in this locality, 6 to 7 months, and sometimes even more, in consequence of the cattle breeder's desire to accumulate as much manure as possible.

In the far east of the non-Chernoziom region, in the localities of the forest-field system, owing to the abundance of lands and forest pastures, the cattle find plenty of under-foot food during the summer; in winter, however, they lose their flesh, because little care is taken of them, stock not forming a profitable branch of economy here, but only supplying the needs of the local population.

In the west of Russia, in the governments of the Baltic, in the western, Vistula, and partly in the south-western governments, stock raising forms a profitable branch of industry. Here, in many cases, the best breeds of milch cows are raised; the feeding is systematic and rational, and the animals are mostly kept in stables; in general the methods of stock farming approach little by little those of Western Europe.

The various topographic and climatic conditions make stock raising in Transcaucasia very much like that in other mountainous countries, as for example, Switzerland and Spain. The whole of the highland is exceptionally good for summer pastures; it is called *eila g*. The extensive steppes of the Tiflis, Elisabethpolsk, Bakinsk and Erivan governments have a very hot climate and a very poor summer vegetation, which often becomes burned out by the sun. Owing to frequent autumn rains these steppes are often covered with good vegetation, and as very little snow falls here the herds can enjoy their pastures for many months in the year. These steppes, lying on the rivers Koura and Araksa, form the winter feeding grounds, called *kishlag*, and fine herds are kept by the people of Transcaucasia. When insufferable heat begins on the steppes, drying up all vegetation, the stock is then sent to the mountains, which are covered with excellent forage. When the cold weather sets in and snow begins to fall in the mountains the herds again seek the steppes.

The total area of summer pastures in the Caucasus is nearly 2,870,000 dessiatines, and the total area of winter pastures is about 1,708,000 dessiatines. Without doubt, owing to the extensive pastures, stock raising in the Caucasus will have a brilliant future. By approximate calculations, the Government pastures alone can feed at least 10,000,000 head of small stock.

The attention that the Government is paying to the requirements of successful stock raising, aided by the numerous estate owners with well organized stock farms, gives the hope that this branch of rural economy will soon occupy a very important place in the Empire. The measures taken by the Government of the greatest importance are those which are directed to helping the poor peasants, who form the bulk of the village population, such as measures which tend to control the ravages of the cattle plague, the epizootic, to spread scientific measures amongst landowners, and finally, to facilitate the sale of all animal products on the interior and foreign markets.

#### BREEDING OF HORSES.

The number of horses in European Russia, relative to the number of inhabitants, is very considerable; in general it may be said that to each 100 inhabitants in the country, the Uralsk district included, there are 25 horses. Such a per cent exceeds even that

in the United States, where there are 24 horses per 100 inhabitants, and it exceeds still more that of the countries of Western Europe, where the relative number of horses per 100 inhabitants varies from 2 to 17. The greatest number of horses relative to the population is in the eastern, south-eastern and western governments, and the smallest, in the governments of Poltava and Petersburg. In the total, eastern Russia is richer in the relative number of horses to the population than the western. Work horses, that is, such as are older than 4 years, formed in 1882 for the 58 governments, 75·8 per cent of all the horses in those governments.

According to the data of 1888, in the 41 governments of European Russia the peasants owned 81·07 per cent of the total number of horses, the large landowners, 15·5 per cent, and the town inhabitants, 2·08 per cent. The same data show that there were 40·1 per cent of peasant households possessing a horse, 31·03 per cent owning 2 horses, and 28·6 per cent, three or more horses. The number of peasant households having no horse formed 29 per cent, of which the greater number were in the south-western governments, and in Little Russia, where the beasts of burden are oxen and cows and not horses; the smallest per cent of households without horses was in the north-western governments. According to their size horses were divided in 1882 into three categories: 1. horses lower than 52·5 dumes, or 1 arshine and 14 vershoks; 2. taller than 52·5 dumes; 3. horses above 56 dumes, or 2 archines. The first category formed 58·8 per cent, the second, 28·5 per cent, and the third, only 12·7 per cent. The greatest number of small horses is met with on the western border, and the greatest number of large horses in the central trade regions, such as the Baltic, north-western and Vistula governments.

In the 41 governments, according to the horse census, the total number of horses increased to 619,757, from 1882 to 1886. The number increased in the 13 governments of the trade region, in some of the Baltic and Little Russia governments; in the remaining governments the number decreased.

As to the breeds and designation of Russian horses, the bulk of them are the peasant and steppe horses. There are very few purely local or foreign breeds in Russia. Such horses as trotters, the so-called Orlov breed, English or Arabian steeds, pere-sherons, Clydesdales, ardens and their crosses, are bred exclusively in the Imperial studs and in those of the large estate owners. In some governments, where local conditions are favourable, the peasants try to improve the local breed and have small studs, for example, in the governments of Voronezh, Tambov and Penza. But for the greater part no attention is paid to improving the breed. The Administration of the Imperial stud was founded according to the desire of Emperor Nikolas I, in 1842, and existed during the first 38 years, from 1843 to 1881, sometimes as a separate administration and sometimes as a section of the Ministry of the Imperial Domains. During all these years the Administration, with the aid of private horse farmers, was active in furthering more scientific methods with reference to horse breeding, such as the publication of a well-edited Horse Journal, and the general dissemination of practical information among the peasantry. By an Imperial Ukase of June 1, 1881, the principal Administration of the Imperial studs was organized as a separate department.

At the present time the Imperial studs tend principally, by all the means possible, to breed horses good for draft, for farming purposes, the cavalry, for town use, and for trotters. To attain this end the Government has resorted to the same measures as before, but has increased the proportion of fine stallions. The Imperial studs contain more

## HORSES.

**Chapter X Live Stock, Map No. 3.**

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Number of horses in per cent of the total number of live stock.



7-10



10 - 15



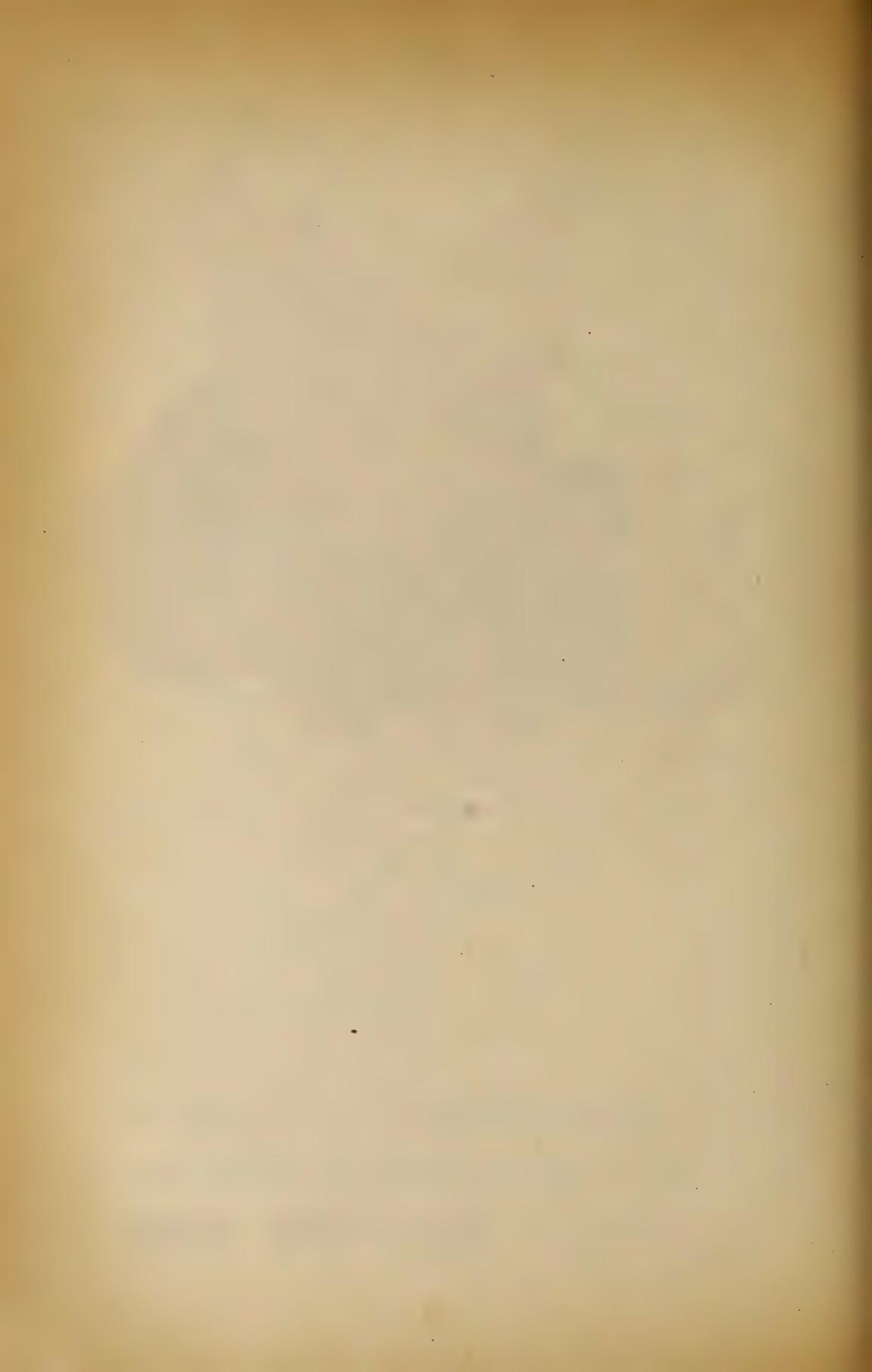
15 - 20



20-30



30 and more



horses, and the dimensions of prizes for encouraging racing of trotters have augmented during late years, as may be seen from the following data:

Number of stallions, belonging to Government, in use in 1881, 1,053; in 1892, 1,916; number of breeding mares in 1881, 18,348; in 1892, 47,142.

In 1892 there were in all 27 Imperial stables, and in the 58 governments of European Russia there were 846 breeding stables.

The number of horses in the Government studs, where English, Arabian and Orlov trotters and many draught breeds were bred, grew from 2,713 in the year 1881, to 3,024 horses and mares of different ages, in 1892.

The racing reports show the same development in the studs.

R a c e s .	The total wager.		The average value of the prizes.	
	1881.	1892.	1881.	1892.
	R o u b l e s .			
In hurdle races . . . .	166,298	704,096	551	930
" races . . . . .	128,224	532,443	329	581

Besides this, owing to the trouble taken by the Principal Administration of the Imperial studs, the railway tariff for transporting horses was diminished. This regulation, existing only since 1890, must have a great influence on the development of private breedings. According to data of the horse census in 1888 there were in the 41 governments of European Russia 1820 studs, with 4,732 stallions and 35,776 mares. Besides, in the districts of south-eastern Russia and in the steppes of Central Asia there is a great number of large studs. In the Don district alone there were 83 studs, containing 1,530 stallions and 20,121 mares. Studs for trotters and draught horses are principally in the northern and central Chernoziom governments, and for riding horses, principally in the south-western governments, in the districts of south-eastern European and Asiatic Russia.

There is no doubt that for the improvement of horses in Russia, studs for trotters and English breeds have the greatest importance. From the breeding of fine stallions with country mares, good work horses are produced for farm and town use. English real trotters and half-breeds serve for improving local steppe horses and the Caucasus breeds. There are so many studs for trotters at the present time that in that direction Russian horse breeding is quite secured. All the strength of the Imperial and private studs must tend to increase the quantity of trotters, as from the sufficient number of pure trotters depends the improvement of the Russian cavalry.

Thoroughbred trotters began to be imported into Russia at the end of the past century, and since then the breeding of that species has developed gradually. Since 1812, owing to the calamities of war, horse breeding was entirely neglected, and only in 1830 to 1840 was it again revived. Owing to the perseverance shown in breeding good horses by the Administration of the Imperial studs, and other companies, thoroughbreds have greatly developed during the last ten years. At the present time there are in Russia two Government studs, Derkoulsk and Janovsk, and several private breeding stables in the different regions of the Empire for thoroughbred trotters.

Amongst the many breeds existing in Russia the so-called Orlov trotter is of the greatest importance. This breed was founded by Count Orlov-Chesmenski at the end of the last century. The Orlov trotter originated as a cross between the Arabian and English, Dutch, Danish and Meklenbourg breeds. There is no doubt that the Arabian stallion "Smetanka", and the stallions "Polkan I" and "Bars I" which descended from him, had the greatest influence on the origin of the Orlov trotters. Owing to such a mixture of types, the Orlov breed has no great uniformity of construction; among them there are horses of the eastern type, and horses more like the Dutch and Danish. As now horse breeders aim principally at speed, one can oftener meet, at the best studs, trotters having a thin construction, a sunken chest and highly developed muscles. Formerly horse breeders tried to raise large cart horses. The predominating colours of the Orlov trotters are black and gray, bay, brown and chestnut horses are seldom met with. This trotter is about 61 dumes, or 2 arshines and 3 vershoks tall, and attains sometimes to 68 dumes, or 2 arshines and 7 vershoks. The best trotters make 2 miles in five minutes, and even better. The celebrated Russian trotter «Viun» made 1·5 verst in 2 minutes and 22 seconds. In comparing the Russian trotter with the American, it must be kept in view that Russian race courses are arranged much less scientifically than the American; that the horse is trained when it is much older, not before it is 2 to 3 years; that Russian racing sulkies are much heavier than the American and that the trainers and riders are not as skillful. There are very seldom in Russia races for three year olds, and only in 1891 the Moscow Society of Amateurs offered a large prize for three year olds, at the «Russian Derby». The American system of bringing up and training horses has gained the approbation of all the principal Russian horse breeders and sportsmen. The book of the celebrated American trainer, Marvin, twice translated into Russian, is a necessity to every Russian amateur.

Among the horses of the country type, the most important are the small, but well built, strong and rapid horses, bred in Finland and the Baltic provinces, and known under the name of klepper and shvedka. The latter is a little larger than the former, but in build, color and other qualities, they are both very similar. The size of the klepper and shvedka is from 56 to 61 dumes. Their predominating colours are chestnut, brown and light bay. The kleppers, and especially the shvedkas, have pretty round forms, dry veiny legs and very strong constitutions; moreover, they are very rapid. For country work and town use these horses are highly prized.

In the governments of Voronezh and Tambov the peasants of many villages breed large country horses, used also for transporting loads to town. These horses, which have no special type, are called in some villages bitug, taking their name from a small river in the Voronezh government. There is no doubt that this breed was formed by intermixing the draught breeds of western Europe. It is even supposed that the bitugs began first to be bred in Russia from the time of Peter the Great, who imported into the government of Voronezh Dutch stallions. The colour of the bitugs is very inconstant, their varying size from 59 to 66 dumes, or 2 arshines 2 vershoks to 2 arshines 6 vershoks.

Of the steppe horses, which are mostly better for riding than for any other use, the Kirghiz types are the most renowned, and are bred on extensive plains of the south-east of European Russia and in the steppes of Asia. The Kirghiz horses are firmly built, are very strong, enduring and rapid. It is very remarkable that among them there are many pacers. In the steppes of the Saratov government, in the Don districts and in

many south-eastern governments, horses of the Kalmyk, Bashkir and Don breeds are raised. All these horses belong to the group of the Mongolian type and are very much like the Kirghiz types. The colours of these horses vary greatly, their size ranging from 53 to 59 dumes. The Don horse is most often bred with English and Arabian trotters. Mongrels from such a crossing are very tall, enduring and rapid. The Russian cavalry is principally supplied with these horses, bred in the district of Don.

In the Caucasus and Turkestan, horses are of Kabardin, Karabakh and Tourkmen breeds, resembling much more the eastern than the Mongolian type. They are also of different colours; they are energetic, enduring but small, like all steppe horses. The crossing of the local breeds with English trotters gave also very good results.

Till now, studs are so organized in the steppes that several young mothers and mares are pastured together with the stallion, who becomes the head of the herd. Such a wild keeping of horses hinders very much the improvement of steppe horses by bred stallions which cannot endure such rough treatment. Besides this, the keeping of horses in such herds, called *kosiak*, does not admit of training and feeding the colts regularly. However, during recent years a tendency to more perfect methods is remarked in the steppes. Better feeding and training and the crossing with high bred horses will give the possibility of obtaining from steppe mares valuable breeds, which will be easily sold on home and foreign markets. The south-east of European Russia, and the steppes of Central Asia present such a vast area for horse breeding, that there is no doubt that the industry in southern Russia will have a brilliant future. Until lately many Russian horse breeders have not had enough means and knowledge to raise good cavalry and equipage horses, the species now in the greatest demand.

#### HORNED CATTLE.

According to the numbers of cattle relative to the density of the population, the first place belongs to the districts of the Don, and next to the governments of Astrakhan, Bessarabia and Esthonia; the smallest ratio is in the north-western governments and in Little Russia. In general, it may be said that the border governments are richer in cattle than the central. Although the absolute number of cattle has increased during the last twenty years, the number relative to the population has decreased; in 1857 there were 37 head of cattle per 100 inhabitants, and in 1888, 30·6 was the ratio. Town cattle form 2 per cent of the total quantity. In peasant households, adult cattle form 61 per cent, and young cattle 39 per cent; on large estates adults form 70 per cent, and young cattle, 30 per cent. Oxen on such estates form 27 per cent of the total number of horned cattle.

Russian cattle vary greatly as to their origin, zoological qualities and productiveness. In the northern, north-eastern and central Chernoziom and non-Chernoziom governments the cattle of local origin are small, being more suitable for the dairy than for work or fattening. On the borders of many rivers in the northern region of Russia the local cattle, enjoying better food, better breeding and keeping, are of a larger size and the cows give more and richer milk. Cattle of the southern steppe, south-western, Little Russian and south-eastern governments are of large size, capable of hard labour, and fatten easily; they are known under the name of steppe cattle. Among these there are three quite different breeds, being of different colour, different forms of body and, probably, of different origin.

The small northern cattle, known under the name of Great Russia cattle, vary greatly in the different governments; they differ in size, form and productiveness, as the conditions of their existence are extremely various. In the far northern governments the cattle are mostly without horns, and near to the central governments almost exclusively horned cattle are raised. The horns of the Great Russia cattle are not large and have the same curves as those of the Jersey, Breton and other West European species. The colour of these cattle also varies considerably, but mostly spotted, red and white, or black and white. The cows have well developed udders, and when well fed and kept, they give considerable quantities of milk; in good herds the average milking attains from 150 to 200 vedros yearly, the average weight of the cows being 900 pounds. The milk of Great Russia cows contains 3·7 per cent of fat, the highest being 8·8 per cent; for 1 pound of butter from 20·76 to 25·98 pounds of milk are required.

Although very few attempts have been made to improve this breed of cattle yet owing to the bad conditions in which the cattle of Great Russia live, the exclusive method of breeding seems to be the better, in as much as the intermixing of these cattle with foreign breed produces no good results, probably because such efforts are not attended with improved methods of feeding and raising the stock. Certain it is that the efforts to breed fine stock are conducted with little knowledge of scientific stock farming.

In the lower current of the Northern Dvina, principally in the district of Kholmogor, government of Archangel, the so-called Kholmogor cattle are raised. This breed originated from crossing local with Dutch cattle imported for this purpose by the order of Peter the Great. For keeping up the breed the import of foreign cattle was repeated in 1818, 1819, 1846 and 1865. The breeding of milch cows in the localities of northern Russia was much developed, owing to extensive pastures and meadows, dispersed in great areas on the lower current of the Northern Dvina. The Kholmogor cattle are black spotted, and resemble very much the Dutch stock, but they are taller and have coarser heads and bones. The cow gives less milk than the Dutch breed, but the milk is of a better quality. The Solovets cows give 150 and in some cases 220 vedros of milk yearly. From 700 to 800 of the best Kholmogor cows are sent yearly to St. Petersburg, where they are highly prized because of the excellent quality of their milk.

Of the steppe breeds the gray Ukraine cattle and the red Calmuck have the greatest importance to the farmer. The former are principally raised in the southern steppe, south-western and Little Russia governments, and the latter, in the south-east of Russia, on the right border of the Volga. The gray Ukraine cattle are very tall, have thick bones, well developed shoulders and strong muscular legs, in a word, they are built like all work cattle. The Ukraine ox weighs alive, from 28 to 36 pouds, and when well fattened 55.5 pouds. As to the size and working capabilities, the Ukraine cattle excel the Calmuck but are not so early matured, and fatten less easily, giving an inferior quality of meat. The crossing of Ukraine with the Kiansk and Sharolezsk breeds has given good results: the mongrels are of good construction, tall and more easily fattened than Ukraine cattle, and the quality of the meat improved.

The cattle bred on the left side of the Volga in European Russia and in all the steppes of Central Asia, are known under the name of Kirghiz cattle, and according to size and colour are divided into several branches, resembling one another as to their principal qualities. The Kirghiz animals are smaller than the Calmuck, brown, black or

## LARGE-HORNED CATTLE.

~~Chapter X~~ Live Stock, Map No. 4.

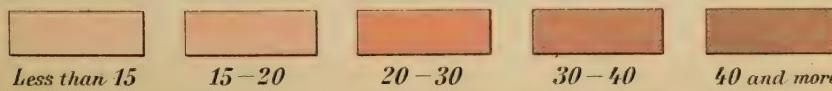
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Number of large-horned cattle in per cent of the total number of live stock.





black-spotted; they work well, and the quality of the meat is good. The three steppe breeds of cows give very little milk, scarcely enough for feeding their calves. On the best of farms the Ukraine cows give from 70 to 100 vedros of milk yearly.

Of the cattle bred in the Caucasus, the most remarkable are the tarakamsk and grouzin breeds, good for work and easily fattened, as also the Khevsourksosetinsk breed, which are good milkers. If all that Russian farmers have done for improving their live stock be taken into consideration, it must be acknowledged that as cattle raising is one of the principal branches of farming, not enough interest has been shown in this direction, due in a considerable degree, to the absence of good markets for animal products and to the frequent ravages of the cattle plague which made the farmers unwilling to reorganize their herds.

A practical method of raising calves, a regular crossing of fine breeds, well organized farms for preparing beef cattle are to be met with in Finland, the Baltic governments, in some of the large plantations of the other regions, and on some peasant farms of the northern non-Chernoziom governments.

The Ministry of Imperial Domains, seeing the necessity of improving the live stock in Russia, organized in 1883 a Commission, presided over by an academician, A. F. Middendorf, for examining the condition of that branch of farming in Russia. The results of this Commission were published in four parts and contain much valuable material on the cattle raising of the different regions of Russia. The members of that Commission, being well acquainted with the state of the industry, suggested many measures for its improvement. Among these measures were: public lectures on milk farming, cattle raising and pasturage, the publishing of the most noted works on the subject, and periodical cattle expositions. Besides, the Ministry of Imperial Domains, by buying cattle of improved breeds, and the raising of such animals on the farms of the Ministry, conducted much to the spreading of such stock on private homesteads, and by organizing farming schools improved that branch in the northern governments of the Empire.

#### S H E E P R A I S I N G.

The number of sheep, relative to the population, decreases in Russia in the direction from south to north, and in north-western Russia there is an especially small ratio of sheep to the number of inhabitants. The governments, which are richest in sheep, are Tauride, Astrakhan, Ekaterinoslav, Don and Kouban; less numbers are raised in the north-western and western governments. The sheep bred in Russia may be divided into two groups: fine-wool or merino sheep, and coarse-wool or common sheep. In the governments of European Russia, except the Koubansk, Tersk, Uralsk and Stavropol governments, the merino form 20 per cent of the total number. But if the sheep of the above mentioned governments be taken into consideration, the ratio of the merino to the total of all kinds of sheep would be from 28 to 30 per cent.

During the years 1883 to 1888 the actual, as well as the number of sheep relative to the amount of population, has greatly decreased; thus, in 1883 there were per 100 inhabitants 59·4, and in 1888, 52·9 sheep. The fall of prices of merino wool, the development of agriculture, the bad crops and small sales of mutton were influential in bringing about the decrease in the breeding of merinos, namely, 15 per cent, from 1879 to 1882.

The breeding of these sheep has decreased especially in the southern steppe governments. During the two latter years, owing to the bad crops of grass and straw, the number of fine-wool sheep have decreased still more, the greater part of them being sold for slaughter, or killed for home consumption, and many of them having died during the winter and spring from cold and hunger, and from the consequent deseases. The above named circumstances, which affected so seriously the fine-wool sheep, had a lesser influence on the coarse-wool species, and therefore the latter have largely supplanted the former, especially in the south-western governments. The breeding of coarse-wool sheep is very profitable for the peasants, producing for them milk, cheese, butter, mutton and sheepskin, called *s m o u s h e k*. For this purpose the local breeds are better suited, as will be seen below.

Sheep raising is very successfully carried on by many households. The owners pay great attention to the breeding, and care of fine-wool animals, because of the profits this branch of farming gives them, especially on the great estates of the southern governments. Fine-wool sheep, which are kept on large estates in herds of from one to ten thousand, are fed in summer either on steppe pastures, which are always covered with grass, or on fallow lands, stubble fields, meadows or commons. In winter the flocks are kept either on hay alone, or on hay with a greater or less amount of straw and husks. The animals feed generally in herds, called *o t a r a*, ranging from 500 to 1,000 and 1,500 heads. In summer they remain very often on the pastures night and day, and are housed at night only when cold or rainy weather sets in.

The sheds for sheep are made from different materials, dependent upon the climate and the locality. Sometimes they are made of wattle hedge and straw, sometimes of straw and cane, sometimes of brick, clay and stone. On well organized farms the flocks are fed in sheds from mangers, and in other cases, out of doors where the hay or straw is scattered for them on the earth or on the snow.

Besides the above mentioned unfavourable circumstances which retard the development of sheep farming, the cold and storms which destroy the animals often in great numbers must also be considered. Furthermore, the want of pasture on peasant lands, and the many diseases, of which the most fatal are the Siberian plague, diarrhea among the young lambs, the pox, disease of the liver, *t a b e s d o r s a l i s* and scurvy, often play havoc with the flocks.

The Emperor Peter the Great was the first to attract the attention of Russian farmers to the advantages of breeding fine-wool sheep, and during the whole of his reign, he endeavoured to increase, with all possible measures, the number of fine flocks and to establish cloth factories in the Empire. In 1720 Peter the Great with the aid of foreign sheep breeders established herds, from which breeders were distributed free to private farmers on condition that the wool from such sheep should be sold to the Government cloth manufactories. The first merino sheep were imported by Peter the Great from Silesia. In 1724 he sent money to the Russian Ambassador in Madrid to purchase Spanish ewes and rams. But unfortunately there are no data showing whether these sheep were ever introduced to any extent.

During the reign of Catherine II, the breeding of merinos was still more developed, especially as such rich landowners and influential people as Vorontsov, Roumiantsov, Cochoubei, Nesselrode and others imported the breed from Spain and Saxony. For the working up of merino wool many cloth factories were established in different

# SHEEP.

Chapter X Live Stock, Map No. 5.

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Number of sheep in per cent of the total number of live stock.



17-30

30-40

40-50

50-60

60 and more



parts of the Empire. The breeding of merinos attained its full development during the reign of Alexander I, who distributed lands, in the southern governments, to foreign sheep breeders. In a short time the industry had such a firm foundation that in 1817 a statute was ordained, prohibiting the further distribution of Government lands among private herders. During the last years of the reign of Alexander I, and during that of Nicolas I, the Government tried to uphold the development of the breeding of fine-wool sheep by all possible measures. Of the merinos, the most general in Russia are the electoral or Saxon breeds, and the negretti. The sheep of the electoral type, in their original condition or improved by rams of other breeds, are most generally raised in the south-eastern or eastern regions, and the negretti sheep, in the south-western or southern steppe governments.

By continual culture the negretti breed has acquired a larger and stronger constitution, with longer wool and heavier fleece. The merit of improving them belongs principally to a sheep breeder of the government of Ekaterinoslav, named Mertsalov, who died in 1853. He called this improved type the infantado, in order to distinguish it from the negretti, a species bred in Austria and Germany. At the present time there are many herds of infantados in the governments of Ekaterinoslav, Kharkov, Saratov and others; they are of medium size, the wool thick and silky and of average length. The best rams give from 25 to 30 English pounds of unwashed wool, and the ewes, from 12 to 15 pounds.

In some southern steppe governments, and especially in the steppes of the northern Caucasus, merinos of another real Russian type are bred and which are distinguished from other Russian and foreign breeds by their long silky wool and the great weight of the fleece. The demand for long wool, especially from the English manufactories, the dry climate and the low prices for mutton, were the principal reasons which led to the breeding of this type. There were many sheep growers in southern Russia who tried to raise such sheep as would answer the above demands, but the best results were acquired by Mazaev, of the government of Tauride, and consequently the type of his breeding is known as the mazaev sheep. These animals are of average size with short legs, deep folds of skin on the neck, and are thickly covered with wool. The length of the wool is from 2.5 to 3 inches; the fleece of the best rams weighs from 30 to 40 English pounds, and of the ewes, from 12 to 20 pounds. At the present time there are many animals of the mazaev breed in the Empire. Of the foreign merinos, in some herds the improved electoral and French ram bouiller are bred. There are many flocks of the latter and the demand for the ram bouiller breeding rams increases, dependent on the orders for long wool on the home and foreign markets.

The local breeds of coarse-wool sheep are numerous and varied. According to the character of their product they can be divided into the following classes: those bred for wool, for the skins, for milk, and for meat.

Of the sheep grown principally for the wool, the most notable are the tsigaisk and voloshsk. The first is bred in the south-west and the second, in the south-east of Russia. The tsigaisk sheep have spiral-formed horns, a long thin tail, erect ears and are of medium size; the rams weigh about 140, and the ewes about 100 English pounds. The weight of the fleece is about 8 English pounds, and the length of the wool from 1.5 to 2 inches. The wool is soft, a little yellowish, and contains but little oil. The voloshsk sheep have still longer horns and the wool is pure white. The tail is

also long, and has at its root a layer of fat; the wool is from 4 to 7 inches long, but coarse; the fleece weighs from 4 to 6 pounds. The tsigaisk specimens are easily fattened and give very good mutton. The wool of both of these breeds is exported in great quantities to the United States. The offspring of the voloshsk breed are spread on the Crimean peninsula and known under the name of the malich sheep; their flesh is excellent.

The best sheep for skins, good for winter clothing, are the romanovsk breed, raised in the government of Yaroslav. This breed is an offspring derived from the short-tailed sheep, of the north of Russia. The rams have short horns, and the ewes are generally hornless; the tail is short and naked, the wool gray, of average length. the fleece not heavy. These sheep have a down of remarkable quality, it is so soft and thick that the skins, especially of young lambs, are excellent for the winter clothing of the country and town population.

Among the breeds of sheep, which furnish fine lambskins, called smoushka, the first place belongs to the Karakoul breed of the Turkestan. The skins of new-born lambs of the karakoul type have a black, glossy wool, prettily curled, and which is very durable. These qualities render the karakoul skins very dear; they serve for adorning winter dresses and are the fur known as Russian Astrakhan. A good skin costs from 10 to 15 roubles. The karakoul sheep is of average size, with small horns, drooping ears, a tail fat at the root, and with gray or black wool. During late years the Ministry of Imperial Domains and some Farming Societies had this breed of sheep brought from Turkestan for improving other breeds, and especially those of the reshetsilov type, which also give good lambskins. This latter variety and the sokolsk are both bred in the government of Poltava, and give great quantities of milk, principally used for making cheese. But the sheep giving the greatest amount of milk is the coarse-wool Bessarabian breed, known by the name choushki.

The breeds, which are the easiest fattened and which give the best mutton, are the Caucasian, such as toushinsk, karachaevsk, pshavsk and grouzinsk. All the Caucasian sheep, and those resembling them in the other localities of south Russia, have long fat tails, spirally formed horns and drooping or half-drooping ears. The wool is of different colours, and of some breeds it is silken, glossy and long.

Among the sheep used for mutton, the most celebrated is the fat-tailed breed of the Calmuck and Kirghiz steppes. It gives very good, fat mutton, and the animal is very hardy. The great quantity of fat which accumulates in the hind quarters during the summer serves as a source of blood supply for it during the winter fastings. The strong muscular legs make this sheep capable of long journeys.

Sheep breeding which, owing to the favourable climate, has attained great development in the south of Russia, has always been much encouraged by the Government. The most important measure, taken during the latter years, was the organization of a Special Commission, ordered by the Ministry of Imperial Domains, to make investigations on the present state of sheep breeding. The extensive works of that Commission, published under the direction of A. S. Ermolov, former member of the Scientific Committee of the Ministry of Imperial Domains and now Superintendent of the Ministry, explain many important questions concerning the principal features of merino sheep breeding. In addition, the same Ministry founded a school in Kharkov; many experiments were made on the question of inoculating against the Siberian plague under the direction

of Professor Tsenkovski; and, finally, rams and ewes of English breed were imported for use on the farms of agricultural schools, in order to further sheep raising for mutton on private farms. After much trouble the Government secured the privilege of exporting mutton into France without prejudice, as well as live sheep. This measure, which has already favourably influenced the export of Russian sheep, must improve the entire system of sheep farming in the south of Russia.

#### S W I N E   B R E E D I N G .

The number of swine, relative to the population, is greatest in the western and northern Chernoziom governments, and smallest in the northern and manufacturing governments of the non-Chernoziom regions. In general, western Russia is richer in pigs than the eastern regions; those bred in Russia are mostly of local types; they are not early matured, of a coarse frame and give meat of poor quality. The Russian breeds are generally easily fattened. There are two principal local varieties, the long-eared and the short-eared. These two breeds differ little from each other as to their construction and general qualities, but the former is considerably larger than the latter. In the western governments, the long-eared type is larger and matures earlier than in the other governments; an average pig one year old of this type weighs, in the western governments, 216 English pounds, or 6 pouds, and a two years old, 360 English pounds, or 10 pouds.

Of the English breeds the most general in Russia are the Birkshire and Yorkshire. Pigs of the polish, chines and temvorsk races are only bred on the farms of the Ministry of Imperial Domains and on some private estates. In general, swine farming is a secondary occupation in the whole of the Empire, the principal reason being the small demands for pork for the Russian table.

Trials have been made looking toward the successful export of salt pork to England and France, and although the Ministry of Imperial Domains has done much to favour the trade, no satisfactory results have been attained, principally, because the pork exported was not to the taste of foreign consumers. Until now there are so few pigs of good breeds in Russia that pork packers have great difficulty in getting a high class of pork for the market. The age of pigs slaughtered and the feed used for fattening them vary greatly on different farms.

#### HOME AND FOREIGN TRADE IN LIVE STOCK, MEAT AND WOOL.

The internal trade in live stock is confined to the markets and bazaars. Some dealers trade in all sorts of farm animals, and others only deal in special branches of the business. The greatest markets are in southern Russia; in those of the Don, Kouban and other governments, tens of thousands of live stock are brought together. Fattened cattle are generally sent to town to be slaughtered and the lean specimens are generally bought by stock dealers and sometimes by farmers. Cattle are fattened principally in the south-western and southern steppes, and also in the Don, Kouban and Ural governments. The cattle and sheep of the northern breeds are seldom fed till they are fat, but are generally sold in the medium condition in the neighbouring towns and villages. In winter the animals are butchered at home and their meat sent to the town markets in the frozen state.

But cattle of the steppes are principally transported alive by railway. Sheep and swine are sold in very small quantities in large towns, as will be seen below. Great numbers of pigs are killed at home and brought into towns in winter in the frozen state, and the meat used for lard and for food in the fresh state, the latter by the poorer classes. The greatest number of the sheep which are rejected from the herd when they are from 3 to 7 years old, are fattened for the tallow, and for preparing salt mutton. Merchants from the towns of Nakhichevan, Orenburg, Kharkov and Kazan occupy themselves with this trade. In 1890 about 845,000 head of cattle were transported by Russian railways, of which 193,958 heads were taken to the Moscow market, and 119,375, to that of St. Petersburg. In the same year the St. Petersburg market received 1,773,700 pouds of meat, pork and game; the Moscow market receives a little less yearly. The number of sheep brought alive to the Moscow slaughter pens did not exceed 1,000 head, and the St. Petersburg market received only from 5,000 to 6,000 head. The average price of fattened steppe oxen has fluctuated during late years, from 85 to 113 roubles per head; of Russian cattle, from 28 to 51 roubles; of calves, from 14 to 17 roubles; of pigs, from 11 to 19 roubles and of sheep, from 6 to 8 roubles. The town of Odessa is the great point of export of live stock. In 1888, 121,000 head of cattle, and 81,000 of sheep were brought to Odessa for sale. Warsaw is also a considerable interior market, consuming about 90,000 head of cattle and about 100,000 pouds of meat. Smaller markets, but very considerable, are Vilna, Samara, Kharkov, Kiev and Kozlov.

At the present time meat is being transported from the farthest points of Russia in the fresh state. The meat is previously cooled and carried in refrigerator cars. The company, which transports meat from the Kuban provinces to St. Petersburg, has special cars constructed according to the systems of the engineer, Chatskine, and of the veterinary surgeon, N. Kouleshov. This method of shipping meat has great advantages over that of carrying live cattle, as the cost of transport is much reduced, and the danger of exporting the cattle plague from the south is greatly lessened. In Orenburg a similar Transportation Company has been organized for carrying meat to St. Petersburg.

The buying and selling of live stock on the Russian markets is at sight per head or per herd, very seldom by weight. This method is very unsatisfactory and leads often to error and trouble; therefore, many farmers have ceased to fatten cattle for they, having less experience in valuing at sight, are often worsted by the stock dealers.

In all of European Russia from 7,000,000 to 7,500,000 pouds of unwashed and scoured wool are produced; of this quantity 2,500,000 to 3,000,000 pouds are merino wool. The greater part of it is sold in the unwashed state. It is either negotiated on the spot or at fairs, of which the most considerable are in Kharkov, Ekaterinoslav, Kakhovka, Penza, Tambov and Warsaw; there is no control over the methods of dealers in the purchase of wool. The Ministry of Imperial Domains, aided by the Kharkov Wool Company, tried in 1885 to organize an auction sale for wool, but the experiment was not supported by wool traders and therefore the effort was not repeated. The principal buyers of wool, at fairs and on farms, are speculating wool traders, who always apprise the qualities of wool at very low rates. This is the principal reason why sheep breeders are so indifferent about improving the quality of their sheep and the methods of keeping their flocks. Only in the regions of north-Caucasus and in the Tauride government, where wool is examined and bought by manufacturers or their agents on the spot, are the qualities of wool properly evaluated. Especially do agents from Odessa

## PIGS.

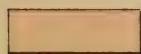
PROPERTIES  
THE NEW LIVESTOCK  
MAP NO. 6.



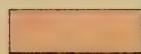
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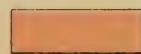
Number of pigs in per cent of the total number of live stock.



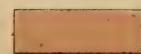
Less than 5



5-10



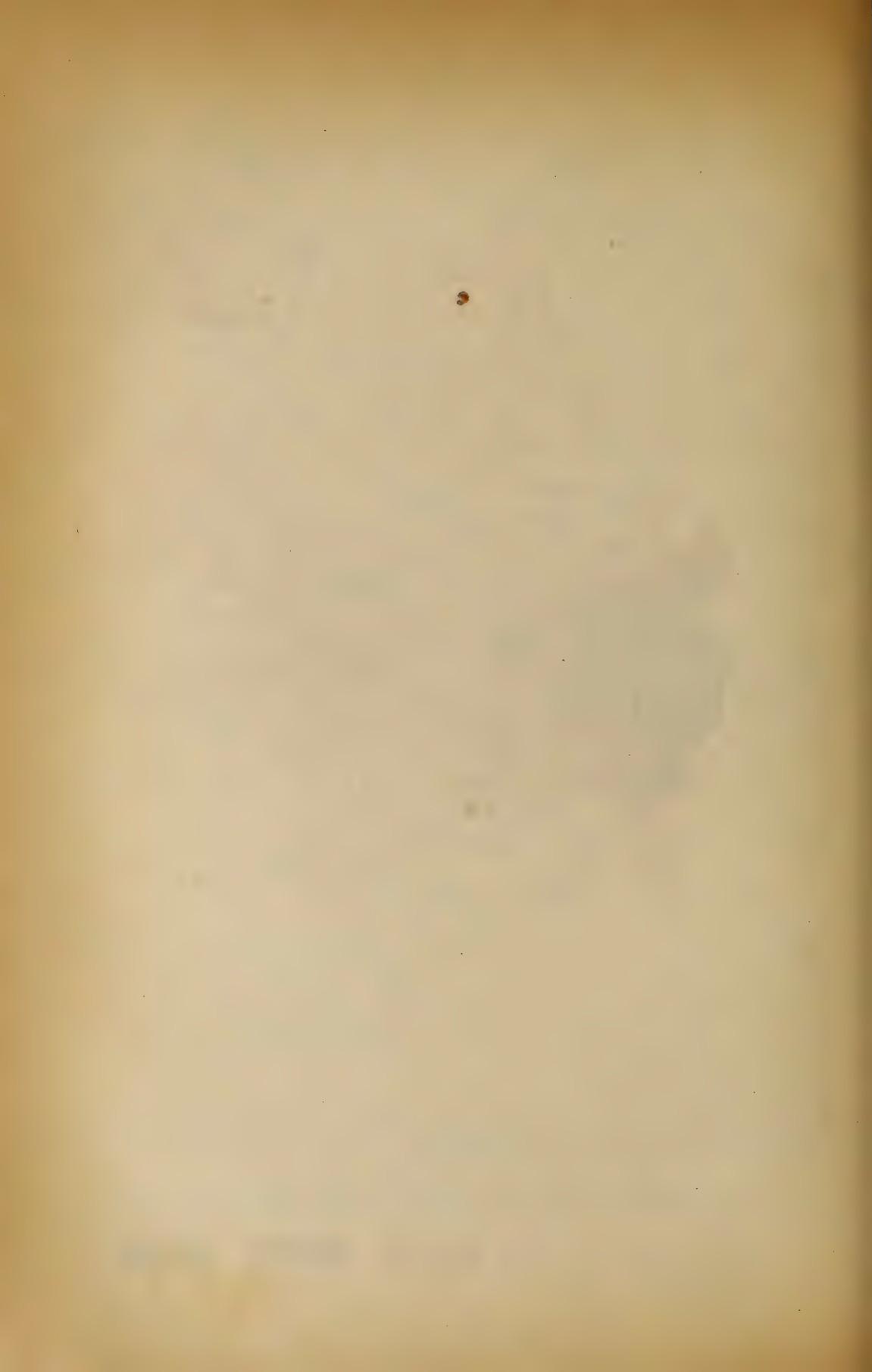
10-15



15--20



### *20 and more*



and Rostov deal in this way. Being often in great want, sheep breeders take from the wool dealers money several months in advance. The high per cent, which the dealers exact from the farmers, is so ruinous to the latter that at the present time the Government proposes to offer to sheep breeders the privilege of securing advance money for their wool from the Government banks. The prices for merino wool have fallen considerably, and those for common, especially for the tsigaisk wool, have risen so that the low grades are nearly equal in value to the merino of medium quality.

The export trade of live stock has in some points increased during late years, and in others decreased. A considerable increase is seen in the export of horses, which from 1881 to 1890 grew threefold. The export of meat, especially of fresh and smoked pork, has increased still more. There is no doubt that the export from Russia of meat products, the development of which is sustained by the Ministry of Imperial Domains, has great prospects for a brilliant future, as Russia possesses enormous quantities of very cheap meat. Finally, a great increase is observed, during the last ten years, in the export of skins, bristles and wool. The export of cattle, sheep and swine has especially diminished in consequence of the increase of taxes and the temporary prohibition of export of Russian cattle to Austria and Germany. However from 1891 to 1892 the export of sheep and swine increased considerably.

The tables on page 222 show the data of the Russian import and export trade in live stock and their principal products.

From these data it is seen that the total export from Russia of live stock and their products is about 51,000,000 roubles, and the total import, 31,000,000 roubles. The principal product for the import and export trade is wool. The rubric of imported wool contains combed, spun, coloured and non-coloured, as also artificial wool.

#### D A I R Y F A R M I N G .

Russia is so extensive that no description of the dairy industry could apply to the entire country. The south of Russia, especially Bessarabia, Crimea and the Caucasus, differs so widely in climate from the northern and central regions that it is impossible to speak in general terms of the state of the dairy trade of the Empire. In the north of Russia, cow milk is exclusively used, and the south makes all sorts of cheese, principally from sheep milk. In the north, milk farming is carried on according to improved methods and has attained considerable development, while the south is rather backward in this respect, and plays but a secondary role in the dairy business. Therefore what follows on the subject of milk farming will concern principally European Russia, without reference to the farms on the southern borders where cow milk is used. Farming in the south of Russia, in Bessarabia, Crimea and the Caucasus, as well as cheese manufacture from sheep milk, will be treated separately. The present article does not include Finland, where farming has always been at a higher stage of development than in any other part of the Russian Empire.

The history of Russian milk farming is divided into two periods: the first, until the years 1865; the second, since that date. The state of the milk farming industry in Russia until 1865 differed very little from that of all other countries before the introduction of technical methods. Wooden and earthen wares, crude implements and machines, primitive technic, and irregularity of method are characteristic of the dairy farming of the first period.

## Export from Russia of live stock and their products from 1887 to 1891.

	1887.	1888.	1889.	1890.	1891.
	Heads. roubles.	Heads roubles.	Heads. roubles.	Heads. roubles.	Heads. roubles.
Horses.	21,052	2,621,130	42,534	4,655,192	37,515
Oxen and cows . . . . .	46,441	3,124,235	25,197	1,580,222	17,467
Rams and ewes . . . . .	324,936	1,596,985	236,537	1,213,411	171,114
Pigs . . . . .	63,692	1,630,156	59,948	1,888,389	34,794
Calves . . . . .	2,344	14,729	223	1,709	1,46
All sorts of fresh meat . . . . .	74,610	298,749	73,527	315,261	197,883
» salted, smoked and dried meat . . . . .	60,131	328,438	87,419	549,936	132,284
» of fats . . . . .	223,248	935,248	190,676	947,764	263,102
» of wool . . . . .	2,034,543	17,325,835	1,447,588	14,539,027	2,404,027
» of leather; raw and manufactured . . . . .	—	7,800,931	—	6,050,052	—
» of bone . . . . .	2,494,203	1,972,563	1,925,814	1,703,086	2,165,641
Horse manes . . . . .	75,114	1,039,162	53,312	613,972	105,047
Horse tails . . . . .	14,178	244,657	17,564	316,264	22,841
Bristles . . . . .	149,786	7,223,516	164,128	9,261,560	168,955
	Pounds. roubles.	Pounds. roubles.	Pounds. roubles.	Pounds. roubles.	Pounds. roubles.

## The import of live stock and their principal products.

	1886.	1887.	1888.	1889.	1890.
	Heads. Price.	Heads. Price.	Heads. Price.	Heads. Price.	Heads. Price.
Cattle . . . . .	13,878	440,970	10,272	353,251	10,472
Sheep and swine . . . . .	72,102	243,240	87,106	289,448	105,230
Horses. . . . .	3,286	479,183	2,541	227,254	2,933
	Pounds. Price.	Pounds. Price.	Pounds. Price.	Pounds. Price.	Pounds. Price.

Raw and half-manufactured wool . . . . .	558,139	18,595,176	585,171	17,987,385	940,813
Manufactured and crude leather . . . . .	—	6,271,135	—	5,689,927	7,215,001
Burned bone and bone coal . . . . .	1,886	4,889	1,153	2,980	651
All sorts of fat . . . . .	106,429	538,580	127,018	490,084	203,217

The wares, in which the milk was kept were made over all Russia, of clay; they were called krinka and had the form of a pitcher, narrowed at the bottom and at the top. They were not glazed and in order to be kept in good condition they had often to be sweetened in hot ovens. A better sort of ware, not so much used, however, were the clay cups and bowls, of cylindric form and widening at the top; later they were glazed within and without.

The milk was taken into the cellar in such wares and placed upon shelves or on the floor to cool and cream. These milk cellars were constructed by digging a pit into the earth, over which a little cottage, i z b a, with shelves on the walls, was built. During the winter, when practical, this pit was filled with ice. In summer all sorts of provisions were kept in such milk houses. When the weather was very hot, the door in the floor was not shut. These primitive milk houses may still be seen scattered throughout the Empire. In them the milk is kept from 1 to 3 days, as circumstances demand. When there is little milk it is thus kept a week or more, until sufficient has accumulated to make a churning. In such cases it very often sours and gives a sour cream, called smetana, and a sour milk, called prostokvasha. The cream is taken off with a wooden spoon and sometimes the sour cream is pushed or blown from the crock en masse. When a sufficient quantity of cream has accumulated, it is then churned. In the first period, butter was made of sour, seldom of sweet cream. Such butter, called finskoe maslo, was not of high quality, as not much care was taken in its preparation. The butter was churned in a Russian churning machine, called tolkachka, a common tub with a lid, through which passed the handle of the churn dasher, called moutovka. The cream was churned into butter and gathered by hand. After churning, the butter was removed and worked on a board or in a wooden bowl, sometimes under water, in order to clean it from the buttermilk, and with the aid of a large wooden spoon or ladle. Butter prepared for the market was made into rolls from 1 to 5 pounds each; when it was sent considerable distances it was packed in wooden tubs or barrels, as at the present day.

Formerly creamery butter was prepared very seldom, but great quantities of so-called Russian butter were produced. Siberian butter is until now an article of import and export. As this product is prepared by many farmers, it is of course not of high quality, and therefore the prices for it are low. This butter is churned, or made in the oven, from sour cream. The other products of milk farming, which are until the present day prepared in the primitive way, are cream, sour cream and curd cheese. There is scarcely any other country that consumes these products in such large quantities as Russia. Cream is used by the people in tea and coffee and with berries, and for the preparation of delicate dishes. Sour cream is a prominent factor in the national cabbage soup, called schi; it is also eaten with pancakes, blini, and with other dishes. Cottage cheese is much made; it is eaten with milk or with cream and sugar. The popular dish, called paskha, eaten everywhere in Russia at Easter time, is also prepared of curds, with the aid of cream, eggs, sugar and spices.

Cheese was not made in the first period of milk farming. The Russians have no national cheese; this product is until now only known among the higher classes, or in the large towns. The principal sorts of cheese, made in Russia, are the belorouesk and litovsk. It is made of curds, pressed with the hand, sometimes only salted, and sometimes with a certain quantity of sour cream and cumin; it is then dried in the

sun, or kept in a cool place. To these primitive sorts of cheese belongs the so-called *knabkäse* or *kümmelkäse*, prepared in the Baltic governments. Formerly, foreign cheese was brought to the Russian markets from abroad. The Swiss cheese was prepared in Russia by some Swiss cheesemongers who kept their method of preparing it in great secrecy. There were very few of such cheese dairies in Russia and there were no means of learning the art at that time.

The second period of Russian milk farming begins from 1865, led by N. V. Vereschagin, who improved the industry, and who until the present day is constantly trying to develop it. After several unsuccessful trials of learning cheese making of the Swiss cheesemongers in Russia, Vereschagin went to Switzerland and learned the secret on the ground. Having made acquaintance with the Swiss cheese dairies, Vereschagin decided to develop milk farming in Russia; he organized associations of cheesemongers, on the same footings as exist in Switzerland. His first trials were much upheld by the Zemstvo in Tver and by the Government. Vereschagin was so energetic that in 1871 the Government permitted him to open the first Russian school of milk farming in the village Edimonovo, government of Tver. Furthermore, young men were sent abroad on Government and private expense to learn the methods of preparing the different sorts of cheese and butter.

Improved milk farming has rapidly developed into a great business which gives large quantities of products, not only for home consumption, but also for the export trade. Already at the beginning of the seventies many cheese and butter dairies were organized, in which specially instructed farmers worked, producing all sorts of cheese, such as the Swiss, chester, Dutch, limburger, French soft sorts, principally bri, camamber, neuchatel, green cheese and others. Instead of the former *finskoe maslo*, other sorts are now prepared, namely creamery butter, sweet and salt, Golstinsk salt butter, and the so-called Paris butter, which is churned from cream, warmed from 58 to 70° R. and then cooled to 10 or 12° R.

There are no data showing the exact number of butter and cheese factories; but there are several thousands of them, and their products supply the much developed home and foreign markets. Formerly, the quantity of cheese used in Russia was measured by that imported and by that produced in the small number of Swiss cheese dairies in Russia. At the present time, notwithstanding the great quantity of cheese produced and consumed at home, as very little of it is exported, foreign cheese is still brought to Russia. The following tables show the average import and export of the principal milk products in five year periods from 1866 to 1890, and also the import and export in 1891:

### Import.

Cheese (cow and sheep). Butter (cow and sheep).

1866 to 1870 . . . . .	59,043 pounds	796 pounds
1871 » 1875 . . . . .	59,007 "	2,461 "
1876 » 1880 . . . . .	59,045 "	1,951 "
1881 » 1885 . . . . .	54,006 "	1,581 "
1886 » 1890 . . . . .	39,833 "	237 "
In 1891 . . . . .	41,476 "	109 "

## Export.

	Cheese (cow and sheep).	Butter (cow and sheep).
1866 to 1870 . . .	5,986 pouds	189,672 pouds
1871 " 1875 . . .	972 "	162,880 "
1876 " 1880 . . .	30,236 "	185,573 "
1881 " 1885 . . .	31,703 "	219,514 "
1886 " 1890 . . .	58,515 "	334,971 "
In 1891 . . . .	63,144 "	433,391 "

The above figures show a considerable decrease in the import of foreign cheese, and in the development of the export of cheese of Russian production. The import of foreign butter has almost ceased during these twenty-five years, and its export has increased twofold. The cheese imported belongs to the highest dessert sorts, such as rockfort, stilton, gorgonzola and tender French cheese, but the greatest part of it is the Swiss, Emmentaliol cheese. The import of cheese is explained, on the one side, by the fact that till now Russia has not been able to prepare the several varieties, such as rockfort and the high qualities of Swiss cheese; on the other, by the fact that the Russian public is little acquainted with the best cheese of home production, such as chester and the tender French varieties.

The improved milk farming is centralized in the governments of Tver, Yaroslav, Smolensk, Novgorod and Vologda. These governments are also the centres from which milk farming spreads over all Russia. Butter making is especially developed in the governments of Vologda, Yaroslav, and also in Tver and Novgorod. During late years it has much improved in the north-western and the Vistula governments. Cheese making is developed in the governments of Smolensk, Kalouga, Tver, Yaroslav, and Novgorod. A less development is noticed in the Volga and neighbouring governments, such as Nizhni-Novgorod, Kazan, Simbirsk, Penza, Saratov and Samara. The governments of the Vistula occupy the third place in the Empire as to the development of cheese making. In the Caucasus the making of Swiss cheese is principally practised, and very successfully.

The principal points of the sale of milk products are Moscow, St. Petersburg, the fair at Nizhni-Novgorod and other large towns in Russia. The yearly increase in the products, their accumulation in the markets and, therefore, their cheapness, forced the farmers to sell their products in the provinces, where, although they are bought in small quantities, better prices are paid for them. The tariffs for transporting milk products by railroads or by water are till now not regulated.

Cheese making, as has been said above, was very little developed in the first period of milk farming and consisted only in the manufacture of Swiss cheese and very small quantities of green and soft French cheese. Owing to the efforts of Vereschagin and his fellow labourers, consisting of a great number of pupils who had made their studies in the farming school of Edimonovo, a whole line of products, unknown until then in Russia and the preparation of which was held in great secrecy by the foreign cheese makers, began to be produced by Russian farmers.

The number of Swiss cheese dairies increased rapidly, and at the beginning there

was a great demand for cheesemongers. Besides those who had learned the trade in Russia, expert cheese makers were invited from Switzerland. Russia did not succeed in producing Swiss cheese of a quality equal to the genuine, but for all that, new sorts of local cheese appeared on the markets, the principal of which are the so-called Russian cheese, meschersk and vereschagin. They are prepared according to the Swiss manner, and being cheaper than the foreign product, are sold in the Empire in great quantities. The prices for Swiss cheese of local production fluctuate greatly, but on the average they are always higher than for other sorts, and range from 6 to 14 roubles per poud. The mode of preparation varies according to the locality and the time of manufacture. On the average 10 to 11 parts of milk give one part of cheese.

Chester began to be prepared in Russia in the beginning of 1870. The method of preparing it from cheese was learned by some specialists in England; the mode of making cheddar was learned in Sweden. Chester is made in few of the cheese factories and after supplying the home demands, which are not great, it is exported to England, where it occupies a high position on the markets. Owing to the unfavourable conditions of transport the export of chester is very much retarded. The prices of this product on the local markets are from 5 to 8 roubles per poud. From 8 to 10 parts of milk produce 1 part of fresh chester. The Dutch cheese and, during the last ten years, the baksteins are of great importance on the interior markets. The latter, owing to their small dimensions, from 4 to 6 pounds, and the easy method of preparation, are produced in great quantities, even by small farmers. These sorts, in consequence of their low prices which fluctuate from 5 to 9 roubles per poud, are extensively sold. The Dutch cheese costs a little more than the bakstein. On the average, 9 to 10 parts of milk give one part of fresh Dutch cheese, and 7 to 9 parts of milk, 1 part of bakstein. Of the soft sorts of cheese the most general in Russia are the French bri, comamber and neuchatel, and the limburger. They are principally produced near large towns, or on farms which are in the neighbourhood of railroads. French cheese is sold by the piece or by weight: large bri is sold at 20 to 30 kopecks per pound; small bri, 20 to 30 kopecks per piece; comamber, 15 to 20 kopecks per piece and neuchatel, 80 kopecks to 1 rouble per dozen. The prices for limburger cheese are the same as those for bakstein. Four to six parts of milk give 1 part of bri, or comamber; 6 to 7 parts of milk, 1 part of neuchatel, and 6 to 8 parts of milk, 1 part of limburger cheese. Besides these rich sorts of cheese, small quantities of other varieties are made from skimmed milk.

During the last 25 years more has been done in Russia to further the cheese making industry than in any other country. The industry is quite new in Russia, and many of the technical means, practiced in western Europe, have not been fully introduced in the Empire. The milk of Russian cows, owing to the difference in the pastures and meadows, has quite different physical and chemical qualities and cannot give products equal to foreign makes. In fact it sometimes happens that the cheese is not only of low quality, but is even almost worthless for the general market. The cheesemongers have had to battle long and hard to establish the industry, and every separate sort of Russian cheese has had to be worked out under great difficulties. The trials made to produce cheese, according to the samples of western European, have cost Russia much labour and money; but the results are that a local technic for cheese making has been introduced,

and the conditions influencing the qualities manufactured, well examined. Some sorts of cheese, especially the French, are so much improved that they are not inferior to the foreign makes. Gradually it has been discovered which regions are the most favourable as regards soil, climate and other conditions, for the industry. Thus after many years of experiment it has been learned that the best regions for making Swiss cheese are the Caucasus, and in parts of Bessarabia and in the Crimea. In the other localities, especially in the north of Russia, until now, notwithstanding the trials of the Russian and foreign cheese makers, no good Swiss cheese could be produced. Of the northern governments the best success at making Swiss cheese was in Smolensk.

As to butter, the sweet sorts are more general in Russia. Cream butter, used in its simple state for the table, is prepared from sweet cream with no salt in it. For kitchen use salted cream butter, as well as golstinsk are used. The prices of butter fluctuate greatly, dependent upon the time of the year, the variety and quality, and the locality of its product. In winter, owing to the scarcity of milk, small quantities of butter are produced, and when it is of the best quality, commands a very high price. On the average, prices fluctuate from 15 to 20 roubles per poud. In spring and in summer, when the cows are all fresh and feed in pastures, great quantities of butter accumulate on the markets, and the prices decline, a poud of butter then ranging from 8 to 12 roubles.

To have a clear idea of the measures used during late years for the improvement of milk farming in Russia, it is necessary to begin with Vereschagin's trials in organizing, in the beginning of 1860, peasant associations for the making of cheese and butter. He aimed principally at using the large quantities of milk, received from separate farms, in such a way that the profits therefrom should remain in the hands of the peasants who furnished the milk. This idea for a long time occupied him as well as the Government and some of the Zemstvos, principally that of Tver. These associations, however, did not exist long, not because of their bad organization, but because the new systems of cheese making became generally introduced simultaneously with the establishing of the associations, and the mistakes in the former resulted to the benefits of the latter methods. Later on, new associations were formed by the peasants themselves.

In 1886 ambulant dairies were introduced in order to disseminate the improved modes of butter making amongst the farmers and peasants. Such dairies, directed by learned specialists and aided by dairy men or dairy women, were supplied with all necessaries for good butter making, having among other improvements, separators and apparatus for examining milk. Such an ambulant dairy, having established itself in a farm or in a village, remained there till the neighbouring farmers or peasants were thoroughly acquainted with the new processes. Thus, moving from one village or district to another the dairy helped the farmer or peasant very materially.

Till 1889 only one farming school existed in Russia, and therefore the ambulant dairies, serving as practical schools, were of great use. Indeed, it must be admitted that, although the dairies were of no regular type and that inevitable mistakes arose in their administration which have not yet been removed, they have had an excellent influence on the milk farming of Russia. Owing to them the use of separators and of improved apparatus has been greatly developed; in some localities associations of women have been organized and, thanks to their existence, the small peasant farmers can sell their products on the market without the aid of the middlemen.

With the development and improvement of milk farming arose many practical questions concerning the chemical and physical properties of milk and its products, the local food of the cattle and its influence on the quantity and quality of the milk, the productiveness of local and foreign cattle and other like questions of importance. The first Russian milk laboratory was founded in 1883 at the farming school in Edimonovo. Due to the experiments of this laboratory it was proved that the milk of the local cows contains large proportions of solid matter and fat; and that the cattle of some other localities in Russia give quantities of rich milk, especially those in some parts of the Yaroslav and Vologda governments. Russian cattle, which have been very little subject to breeding, have had their milk qualities developed by natural conditions. By examining the milk in a large number of samples, it has been found that the milk of Russian cows is much richer and fatter than that of foreign breeds. The average Russian milk shows the following constituents:

		Dry matter contains.	Fluctuations.
Water . . . . .	86·50 per cent.	Fat . . . . .	4·40 per cent. 2·2 to 8·9 per cent.
Dry materials	13·50   »   »	Casein . . . .	3·50   »   »   » 2·3 » 4·5   »   »
	100·00 per cent.	Albumen . . .	0·40   »   »   » 0·3 » 0·6   »   »
		Milk sugar . .	4·50   »   »   » 3·2 » 5·5   »   »
		Mineral salts .	0·70   »   »   » 0·58 » 0·75   »   »
		Total	13·50 per cent.

These figures are also sustained by the data derived from practical tests; thus for example, nearly every where in Russia, according to yearly average, 1 pound of butter is produced from 22 to 25 pounds of milk, 4·0 to 4·50 per cent. A private laboratory in Zapolie, government of Petersburg, and one in Sobokino near Moscow confirm these data. Periodical laboratories have examined milk in the different parts of the governments of Vologda, Yaroslav and Riazan, and have stated that the milk of the local cows is very rich in oil particles.

Since 1889 the Government has tried to increase the number of farming schools in Russia by establishing them in different parts of the Empire. As models of milk farming schools, those existing in Finland are taken. Such small schools, containing 10 to 12 pupils were founded on five estates, with subsidy from the Government. The number of pupils admitted depends upon the number of cows; for each pupil there must be from 8 to 10 cows. The first schools are until now founded in the northern governments as follows: in St. Petersburg, the Andromersk school; in Novgorod, the Pavlikovsk; in Tver, the Zotoshinsk; in Smolensk, the Prechistensk, and in Kovno, the Podgaisk school. Besides these five boy schools, milk farming is taught in two schools, exclusively for girls. The pioneer school, in Endimonovo, governments of Tver, receives as pupils boys and girls, the average number of which is about 60. For such a great number of pupils, of course, one herd does not suffice; therefore the pupils practice on the dairies of the neighbouring villages.

Besides the above mentioned administrations the Government keeps one instructor of milk farming in the government of Pskov, and one instructress in the south of Russia,

for improving cheese making from sheep milk. These instructors follow the practice of the ambulant dairies, with the sole difference that they can move more quickly and easily than the ambulant dairy. The questions next to be considered by the Government, is the means of increasing the number of instructors.

Dairies of sheep milk have existed from time immemorial in the Caucasus, in Bessarabia and in some parts of southern Russia. The art of making cheese and butter belongs exclusively to herdsmen, called ch a b a n. The cheese, called o s e t i n s k, t o u - s h i n s k, b r i n z a and others, serve principally for local consumption, which is very great. Stores of cheese are made by the population, and laid in for the whole year. The above named and other sorts of cheese from sheep milk are prepared very simply; there are no fixed rules for milk temperature, for the time of curdling it, and in general, no strict system for the making of sheep-milk cheese. The material used for milk vessels is generally wood or clay, and the churns are also made of wood or earthen ware; then churns are suspended on ropes and rocked to and fro until the butter comes.

The prices for sheep cheese fluctuate greatly. In the Caucasus rich cheese costs from 2 to 6 roubles per poud; and in Bessarabia the b r i n z a, from 2 to 3 roubles per poud. During late years about 40,000 pouds of sheep cheese are exported yearly. The principal cheese sold abroad is called k a s h k a v a l. During the last three years measures have been taken by the Government for developing the manufacture of sheep cheese in the south, where milk farming is still in a primitive condition.

#### BIRD BREEDING.

Bird breeding is comparatively little developed in Russia, notwithstanding the favourable conditions which the country presents for that branch of rural economy, such as, for example, great areas of free land, the abundance of cheap grain and a moderate climate suitable for the raising of domestic fowls, in a considerable portion of Russia. The principal reason for such slow development of this useful branch of farming, is the small demand for poultry. The peasants eat very little meat, and use principally vegetable food. The inhabitants of towns, having large yards or gardens, generally breed domestic fowls for their own use. Therefore the prices of poultry products are very low in the villages, especially in those far distant from the towns.

The prices for domestic fowls may be averaged as follows:

Hens . . . . .	20 to 25 kopecks per piece.
Chickens . . . . .	5 » 15 » » »
Ducks . . . . .	15 » 30 » » »
Geese . . . . .	50 » 70 » » »
Turkeys . . . . .	60 » 80 » » »
Eggs . . . . .	6 » 10 » » ten.

In towns these prices are higher, especially in winter time, owing to the high transportation rates. Moreover, winter in the greater part of Russia is very long and the fowls kept in cold buildings lay no eggs, and as the population is unacquainted with the improved methods of preserving eggs their stores diminish greatly in winter. In St. Petersburg the average prices from November to April are about as follows:

Hens or ducks . . . . .	0·50 to 1·00 rouble per piece.
Geese . . . . .	1·00 » 1·50 » » »
Turkeys . . . . .	1·50 » 3·00 » » »
Eggs, first grade . . . . .	0·50 » 1·00 » » ten.
» second » . . . . .	0·16 » 0·20 » » »

In large towns, in summer and winter, poultry is sold plucked but not dressed, except geese, which are dressed and their several viscera, especially the liver, heart and craw, are sold separately. In summer, dressed fowls are sold in the fresh, and in winter in the frozen state. Full grown fowls are sold by the piece, and young chickens by the pair, very seldom by weight, except when well fattened. Eggs are sold by tens or hundreds.

During late years, since some foreign agents have organized regular offices for the buying of poultry and eggs, the prices for these products have risen, especially in localities situated near such agencies. Great quantities of eggs are bought by these agents in central Russia, in the governments situated to the south of Moscow. Geese are principally exported from the western and south-western governments.

For export, eggs are bought in spring and autumn. From 1889 to 1892 they averaged from 10 to 15 roubles per 1,000; in the spring and in summer, from 8 to 12 roubles; in autumn they rose to 16 and even 20 roubles per thousand. Eggs for export are packed in the same way as in Western Europe: they are put into long boxes, divided into two sections by crossbars, consisting of several small boards and lightly put together; the eggs are put in layers, each layer separated from the other by fine straw. Each box contains about 1,440 eggs, or 24 sections of 60 eggs each. From 100 to 108 boxes are put into a car. Before being packed the eggs are sorted and the largest only are exported. Some shippers have sorters from abroad. The smaller eggs are consumed by the local population, and also used in albumen factories. Since 1886 Russia has exported the yolks and whites of eggs as separate products; for that purpose they are put in tin boxes and then packed in barrels.

Poultry is sent to foreign markets in three different ways: 1. killed poultry is exported in winter in the frozen state; 2. alive, by the overland frontier; 3. geese are sometimes driven to the markets. Small numbers of poultry are also sent by sea, principally from the southern parts to France. Live fowls are shipped in plaited baskets made of willow boughs. Twenty pairs of young chickens, and in cold weather twenty-five pairs, are placed in one of these crates, and of half-grown fowls, about a dozen pairs per basket; full grown fowls, from 7 to 12 pairs per basket. When fowls are transported by sea they are put into boxes of latticework, divided into two parts, one above the other, each box containing about 50 birds. Besides eggs and poultry, down and feathers are also exported in considerable quantities.

During late years the export of all the products of domestic fowls especially eggs and dressed poultry, has greatly increased, as is seen from the following figures:

Years.	E g g s.		P o u l t r y.	
	Pieces.	Roubles.	Pieces.	Roubles.
1871. . . .	19,167,000	192,000	288,000	—
1881. . . .	66,797,000	813,272	803,000	786,000
1891. . . .	833,000,000	12,662,000	4,425,000	3,907,000

Years.	F e a t h e r s .		D o w n .	
	Quantity in pouds.	Roubles.	Quantity in pouds.	Roubles.
1881. . . .	86,376	1,151,680	1,768	64,917
1891. . . .	129,000	1,775,000	5,000	239,000
Years.	Y o l k s .		W h i t e s .	
	Quantity in pouds.	Roubles.	Quantity in pouds.	Roubles.
1891. . . .	55,000	217,000	9,000	38,000

The principal exporting points for poultry products are Odessa, Libau, Riga and Reval; and on the overland frontier, Virballen, Graevo, Warsaw, Alexandrovsk and Sosnovitsa. In 1881 the total export of poultry products amounted to 2,848,000 roubles; and in 1891, to 18,838,000 roubles. Eggs and poultry are principally sent to Germany, Austria, France and England. The prices for these products on the English markets are always higher than on the continent.

There is scarcely any regular bird culture in Russia; fowls are principally bred on peasant farms and on estates, where from 5 to 10 different species are raised. Of these the principal are chickens, ducks, geese and turkeys; guinea hens are raised in considerable quantities in the south of Russia. Pigeons are not bred at all, as the bulk of the population do not use them for food, it being regarded as a sacred bird. Nevertheless great numbers of domestic pigeons nest under the eaves of houses and on church towers and large buildings. All the poultry raised in Russia are of the common local breeds, but of different varieties. In the same village, fowls may be seen of all sorts and colours, having different combs, and feet of different colours ranging from light yellow to dark brown, and of different shapes. In central Russia there is a special breed of chickens called pavlovsk. They are small, have crests on their heads like the Padua hens, and feathers on their legs. Their feathers are of a gold or silver black, and sometimes with black dots on gold or silver ground. They are remarkable for the beauty of their plumage and for the great numbers of eggs they lay. In Little Russia there are hens, known by the name oushanki, which have two tufts of feathers on their heads, hanging down like long ears. These hens are large, lay many eggs and bring off large broods; they are very good mothers. Their feathers are always uniform in colour, not spotted, sometimes however varying from yellowish to dark brown.

In the Moscow governments the so-called orlovs k hens are the most prized; by their construction they are like the Malay hens, but have beards. They are of a dark red colour and have clean legs. There is no breed of ducks peculiar to Russia, although there are many varieties of the regular breeds, differing in colour, sometimes white, yellow-brown and black, and of various sizes, dependent upon the locality. Duck chickens are not fed in Russia, but are left to procure food for themselves. In localities where there is sluggish water, a slow river, a lake, or a pond, and consequently abundant food, young ducks grow fast and become strong and healthy; but in places where they have no water advantages they degenerate and finally die out entirely. Turkeys are principally bred in the central and southern governments. They are of one breed, but of different colours, white, black, bronze, gray and yellow.

There are various and excellent breeds of geese, such as arzamazsk, kholmogorsk, with excrescences on their noses, sebastopolisk, with long, ribbon-like feathers, and many other varieties. These breeds, no doubt, were procured from the intermixing with improved foreign species, thus, the kholmogorsk, from the Chinese hump-nosed breeds, and the sebastopolisk, from the Danube types.

During the long, cold winters domestic fowls generally sleep in their cold sheds, unprotected from the wind. Sometimes, however, they are placed in stables. Some kind-hearted peasant wives keep their poultry during the whole winter in their cottages, in quarters especially arranged for them under the stove. It is not the custom of the Russian peasant to clean their poultry yards and, therefore, thick layers of guano often accumulate therein. The poultry is generally fed once a day in winter, and in spring, summer and autumn, not at all, as the different kinds of fowls are able to procure their own feed in the open seasons of the year, in the fields, the gardens, the orchards, or in the water, each according to its habit. The food of the poultry consists of the lowest kinds of cereals and vegetable residues, such as scalded husks, potato, seeds, sorrel, spoiled flour of different sorts, and kitchen garbage. Only when chickens, and especially young turkeys, are fattened do they get grain, bread and curds to eat.

No care is taken to improve poultry breeds, and therefore, as from improper methods of feeding, they degenerate, an old hen ordinarily weighing 2 to 3 pounds. Only in some localities hens of good breed are produced, such as the crosses of the cochin-china hens, imported into Russia many years ago. Hens of such mixed breeds are known under the name of gollandsk (Dutch hens). They have feathers on their legs, like the cochin-china breed but, of course, in a less degree.

Considerable poultry yards, where birds of good breed can be obtained, are found near St. Petersburg and Reval. But the greatest number of farmers prefer to import bred poultry from Germany, France and England. Improved technical methods for breeding and feeding poultry are little known in Russia. Artificial hatching of chickens, with the aid of incubators, is only practised by amateurs and a few farmers, and that on a very small scale. Incubators are imported principally from England, and the most used in Russia are the Hirson's apparatus. Artificial, forcible feeding of poultry, or stuffing, is also very little practised in Russia. Only one establishment for artificial fattening of poultry is known; it belongs to a certain Nillender and is situated near Katherinen, a station of the Baltic Railroad, where about 2,000 fowls are fattened yearly. In the most parts of the Empire the birds for fattening are shut up in small quarters and are abundantly fed. Only during late years is great attention turned toward the improvement of fowl breeding in Russia.

There are four societies for poultry culture in Russia: in St. Petersburg, Moscow, Riga and Kazan, and two special bird societies, in Moscow and Kiev, for breeding and improving carrier pigeons. Poultry is exhibited yearly in Moscow, St. Petersburg and Riga. A special journal, called *Viestnik Ptitsevodstva*, (Messenger of Bird Culture), is edited in St. Petersburg. Now great attention is being paid to the teaching of bird breeding in Agricultural schools, near which small poultry yards are being constructed for the breeding of good fowls and for the spreading of such breeds among the neighbouring population. Moreover, the Department of Agriculture sends a specialist to give lectures on bird raising during Agricultural Exhibitions, and in Agricultural Societies throughout the Empire.

Very recently the Government edited a series of rules which render the transport of poultry by railroad much easier. In general it has been recently discovered that poultry breeding is capable of great development in Russia and can be made very profitable to the poorer classes, especially to the peasants. Farmers find poultry breeding a very lucrative occupation; thus the yearly net produce per hen, that is, from the sale of the young chickens and eggs, amounts to about one rouble. Foreign demand for poultry products is always increasing, owing to which the prices for Russian fowls and eggs also advance, and thus make this branch of rural economy more and more profitable.

The breeding of carrier pigeons is principally in the hands of the Ministry of War, which has organized several post-pigeon stations, and has paid during the latter years great attention to the development of this interesting bird. In central Russia, in the governments of Kalouga and Koursk, since very ancient times, canary birds have been more or less generally bred. This occupation is very profitable to the local population, although during late years it is visibly declining and the import of canaries, principally from Austria and Germany, is always on the increase.

#### THE CULTURE OF BEES.

Bee culture is one of the most ancient industries of European Russia, as proved by many superstitions of half-heathen and half-christian character, till now existing among the people. Already in the annals of the tenth century, wild hives were often mentioned; moreover, some Arabian writers of that time speak of the existence of bee culture as an important branch of agriculture in the south-west of Russia. In the first statutes of Russian laws issued in the beginning of the eleventh century, there are many points covered which concern bee culture. Therefore, it is certain that in those ancient times, this branch of farming formed an important occupation.

Many foreigners, who visited Russia as early as the thirteenth century, stated that Russia possessed great quantities of honey and wax, and that this industry was conducted in a more primitive way than in Western Europe, notwithstanding that, according to the opinion of many, bee culture formed one of the most important branches of rural industry in the Moscow principedom. In general, apiculture was of great importance to the economy of the country and to all classes of society, from the peasant to the prince. The products of the industry served not only for home consumption, but were objects of export to many countries of Western Europe. With these products also the people paid their taxes and tributes to the Government.

Thus the measures taken by the Government for the guarding and supporting of bee culture are quite comprehensible. These measures favoured a strict limitation and protection of bee property, with definite rules relative to the control of beehouses, at the same time furnishing measures for the severe punishment of offenders against the rights of beemasters. To steal a swarm of bees, or in any way to destroy bee signs, was especially punishable by law. The punishments of bee thieves varied from severe fines in some places, to the death penalty in others. At that time bee culture was in a wild and primitive state; the bees existed in great quantities in forests covering the greater part of Russia, and the hollows of trees served as hives. The beemasters used to hunt the forests for bee trees, and when found, put their own signs thereon, after which no one else dared to molest the tree or the hive. Sometimes hollows were hewn in the

trees for hives. Till the fourteenth century beehives were quite unknown in Russia, as only at that time they began to be introduced and to replace the wild culture of bees. First of all they were known in south-western Russia.

As mentioned above, Russia exported honey and wax to Western Europe. The bee products, especially wax, were brought to Moscow, Novgorod, Pskov, Kholmogor, and Vologda, and thence exported in great quantities. In Novgorod there were special merchants of wax, called *voschinnik*. In the sixteenth century wax was exported, principally by the White Sea, to England. During the reign of Ivan the Terrible about 50,000 pouds were exported yearly, so that at last, fearing there would not be enough wax for home use, the export was prohibited for a time. In the middle of the seventeenth century the export of wax attained 35,000 pouds yearly, and was even shipped to Italy. In the beginning of the last century, during the reign of Peter the Great, different fiscal measures laid a restraint on bee culture, and probably from that time the industry began to decline. In 1775, the tax, laid by Peter the Great on bee products, was annulled.

The Imperial Economical Society shows the greatest interest in the development of bee culture in Russia by publishing and distributing different works, Russian and foreign, concerning the industry. At the present time bee culture is declining materially in the Empire and, although practised over all European Russia and in many parts of Siberia, does not form an important branch in the occupations of the people. It is mostly amateurs who are now engaged in the raising of bees, and therefore the occupation has at present little trade importance. Some localities in Osetie and Abkhasia in the Caucasus, and in the government of Ufa, where bee culture is the principal industry of a considerable portion of the population form an exception; even there neither honey nor beeswax is produced in quantities sufficient to serve the trade.

Bees are bred in two different ways, wild and domestic. In the first instance their culture is very simple: a swarm of wild bees settles in the hollow of a tree, generally prepared beforehand in such a way as to make it convenient to take out the honey. Sometimes trunks, with hollows dug in them, are fastened to the trees, and the wild bees hive therein. At the present time wild apiculture is much developed in the west, and especially in the east of Russia, in the governments of Kazan, Viatka, Perm, Ufa, on the descents of the Ural mountains, where extensive forests still exist. In these localities bees are bred by the Slavonic and other Russian peoples. The culture of bees in modern times, is gradually replacing wild apiculture, and is developed in the central non-Chernoziom, Belorusssk and Litovsk governments. In the two latter regions, owing to a great number of linden trees, the best honey called *lipovits* (of linden), is produced. In the Chernoziom regions, apiculture is principally developed in Little Russia and in the south-western governments, especially in Chernigov, Poltava and Ekaterinoslav. In the southern part of the government of Chernigov, near Batourin and Konotop, the industry is greatest.

The hives most used in Russia are the so-called *douplianka* or *bezdonka*, and *penek* or *koloedka*. They are both made of trunks, well hollowed. At the lower end the hive is open and affixed to the side of a board. The upper end is sometimes the continuation of the trunk and sometimes is a separate attachment, made of wood or of clay, which can be taken off when desirable. In the side of the hive a hole is made, or a narrow board is cut out. This opening is shut by two stoppers, the lower of which

is taken out when the number of bees is very great. In the inner part of such hives little crossbars are fixed to the sides to sustain the comb.

The peasant apiarists use the above mentioned hives, and the improved systems of section beehives are principally known to estate owners and amateurs only. It must be observed however that during late years improved systems of beehives are being introduced even among peasants, especially in the west and south-west of Russia, in the governments of Podolsk, Volynsk and Vistula. The improved beehives the most used in Russia, are of the English and American systems, Yerson, Berlepsh, Gravengorst, Dolinovski, Borisovski, Levitski and others. Artificial wax is produced only recently in Russia, and that in very small quantities. Only very few persons fabricate it for sale.

The sowing of melliferous flowers for bees is very little practiced, and the bees generally gather honey from the flowers in the surrounding fields, and in the localities of forest from various flowering trees, especially the linden. Buckwheat, which is cultivated over all Russia, especially on peasant farms, gives abundant and excellent material for honey. In the government of Chernigov, for example, buckwheat is the principal food for bees, and if that cereal fails the bees do not thrive. Generally the abundance or scarcity of honey depends upon the condition of field crops, and upon the length of time the crops are in blossom. In case of drought, as in the years 1890 and 1891, from the drying up of the grasses and their rapid defloration, the bees are artificially fed from the beginning of summer, and the harvests of honey and wax are then very small. Honey and wax are gathered in different ways. From the common hives they are taken out by killing the bees, or by a method called *podreznoi*. In the first instance, all the bees in the hive perish; they are suffocated by smoke and then the honey, the wax and the bees are raked out with a hook *en masse* into vessels and then into barrels. Such honey, called *sirtsevoi* or *bochechnoi* cannot be immediately used for food, but is first sent to factories to be prepared. The second method used for procuring honey in comb, may be described as follows: the bees are driven out, in one way or another, dependent upon the construction of the hive, and then the honey is cut out. Sometimes the honey is cut out of the hives after stupefying the bees with smoke, care being taken not to kill the swarm. In hives of improved systems the honey is gathered in the comb, or in the pure state, the honey in the latter case running down into specially prepared apparatus attached to the hives.

There are no data showing definitely the development of apiculture in Russia. But, according to reliable information, it may be seen that, notwithstanding the decline of the industry, it is still considerably practiced in the Empire. Thus, in 1884, in the government of Kalouga, which for its apiculture occupies an average rank, there were 47,800 beehives, of which 652 were of the improved system; the total harvest of honey amounted to 8,300 pouds, and of wax, to 1,600 pouds. In 1882, in the district of Kremenets, government of Volyn, there were 25,910 beehives, of which 547 were of the improved system. In the same year in the district of Vileisk, government of Vilno, there were 2,383 hives, of which 28 were of the improved pattern.

The average income per hive in the first of the above mentioned governments was 60 kopecks, and in the second, 1.07 roubles. In the governments of Poltava and Ekaterinoslav, in the years 1880, there were several hundred thousand hives. In 1886 the number of hives in the following districts was thus distributed: in Ostrogozhsk, government of Voronezh, 51,865; in Gadiach and Lenkovsk, government of Poltava, 27,609; in

Koursk and Belgorod, government of Koursk, 37,424; in Saratov and Atkarsk, government of Saratov, 57,304. Taking into consideration the production of candles of local wax, of which in 1888, 125,000 pounds were used, and admitting that each hive produces 3 pounds of wax and 10 pounds of honey, it must be concluded that Russia possesses not less than 2,000,000 hives. But as wax is not only used for candles but also for other purposes, this number of hives must be considerably augmented. It is supposed by some that the quantity of wax produced yearly averages from 200,000 to 300,000 pounds, to the sum of 1,000,000 roubles, and of honey, about a million pounds, the sum of 7 to 10 million roubles.

In fact, Russian apiculture is at the present time in a transient state, owing to the change in the natural and economical conditions of Russia. Now, it is no more possible to pursue the industry according to primitive methods, without knowledge and without expense, as there are no extensive forest for wild apiculture, owing to the increasing areas of tilled lands. It is necessary to introduce the sowing of melliferous plants and to increase the productiveness of the bees, as the prices of honey and wax, owing to the concurrency of different honey and wax substitutes, have fallen greatly in recent years. But the population, not being specially skilled in apiculture cannot adapt themselves to the new methods and suffer therefore greatly in consequence, as this industry is a very profitable one and, if practised scientifically, can form an important branch in the rural economy of Russia, as in former times.

The importance of apiculture for the peasant and the necessity of having scientific knowledge for the prosecution of the industry, caused an estate owner of Chernigov, a certain Prokopovich, to organize at his own expenses, in 1828, on his estate Palchik, district of Konotop, the first Russian School of Apiculture, where principally peasant children were taught. This school existed 51 years, and during that time the 640 pupils who finished their course therein have conducted much to the development of bee culture in the Empire. The celebrated Professor of Chemistry, A. M. Boutlerov, has done much also for the dissemination of the science of apiculture. His indefatigable activity had good results: in 1884 was organized, on means furnished by the Imperial Economical Society, a school called the Bourashevsk School of Apiculture in the government of Tver. Furthermore, Professor Boutlerov edited the first Russian journal on apiculture, called the «Rousski Pchelovodni Listok», (Russian Apiculture Journal); he wrote several manuals on bees, which were designed for the peasants, and which are justly considered masterpieces.

Owing to the above mentioned measures there are at the present time, in many localities of Russia, well organized beehouses, which serve as models of their kind. Nine Apiculture Societies are in existence, a second periodical Journal is being edited and in many places expositions are being organized. In general, it is to be hoped that apiculture will soon rise again and occupy an important position amongst the other branches of farming industry.

In conclusion, a few words should be said about the trade in bee products. Honey and wax are bought in autumn, beginning from the 6th of August, either direct from the hives, or at local fairs and bazaars, by small traders, who re-sell them to large merchants or to the manufacturers. At these fabrics wax is manufactured, beaten, whitened and then put to further use. The local prices of these products, according to data given by the Department of Agriculture and Rural Industry, were during late years the following.

	In roubles per poud.						
	1889.		1890.		1891.		
	R	o	u	b	l	e	s.
Honey pure . . . . .	4·85	8·00	3·90	10·40	4·55	9·30	
» in combs . . . . .	4·90	10·35	3·20	10	3·75	10·40	
» sirets (in barrels) . . . . .	3·60	5·55	3·45	5·40	3·25	7·20	
Wax rectified . . . . .	16·40	20·50	14·40	22·15	16·85	24·75	
» unrectified . . . . .	6·20	10·30	4·75	10·50	6·25	12·50	

As is seen from the above table the prices are subject to great fluctuations depending on the localities; thus, in the Chernoziom regions they are somewhat lower than in the non-Chernoziom; also near large central towns the prices are higher. The products of apiculture are exported in small quantities, as is seen from the following figures.

Years.	Export of honey and honey treacle.		Export of wax.	
	Pounds.	Roubles.	Pounds.	Roubles.
1886	2,741	12,598	790	13,774
1887	3,621	11,500	372	5,230
1888	2,398	14,192	920	6,818
1889	202	1,356	4,222	16,381
1890	8,254	60,774	569	6,184
1891	3,360	15,803	325	6,148

The import of these products from 1886 to 1891 may be shown as follows.

Years.	Import of honey and honey treacle.		Import of wax.	
	Pounds.	Roubles.	Pounds.	Roubles.
1886	7,845	41,543	26,093	341,078
1887	5,485	24,650	17,902	202,766
1888	4,210	19,230	18,420	232,668
1889	4,493	23,339	37,782	346,012
1890	8,268	35,898	51,286	674,159
1891	—	—	49,422	449,210

#### THE SILKWORM INDUSTRY.

Silkworms are principally grown in the Transcaucasus, Turkestan, and to a considerable extent, in the Transcaspian territory, in the northern Caucasus and in the southern governments of the Empire. In the Transcaucasus silkworms are cultivated by Tartars, Armenians and Georgians; in Turkestan, by the Sartes; in the Transcaspian regions, by the Tekins; in the north Caucasus, by Cossacks and Armenians; and in the southern governments of Russia, by Russians, Bulgarians, Moldavians and Germans. The total number of families cultivating silkworms in Russia is a little more than a million. In general, the growing of silkworms forms but a small branch of farming in the Empire, but many households occupy themselves with the industry in connections with other industries, because they find it very profitable. The quantity of silk, produced by vivified chrysalides, fluctuates from 1 to 20 ounces per household, on the average from 2 to 4 ounces.

Before the murrain of 1860, local species belonging to the varieties of Central Asia were almost exclusively cultivated. During the epidemic a great number of them perished and were replaced in the Transcaucasus by the Japanese green species, by the white Bagdad and the yellow French varieties in the southern governments of Russia, and in Turkestan by the yellow European species. Naturally, these different varieties produced cocoons of different types and qualities.

In Transcaucasia and Turkestan, the principal silkworm regions, generally only local varieties are vivified. They are not subjected to microscopial examination and are, therefore, infected to a considerable degree with the pebrine. Only during the last two or three years chrysalides of better breed, imported from France, Italy and Brusa, have been vivified. In 1892 about 60 pouds of such silkworms were imported into Russia. Moreover, the number of chrysalides not infected with any disease, and cultivated by Government administrations in the Caucasus and Turkestan, is gradually increasing. In the total, about 500,000 ounces of silk are produced by vivifying the chrysalides of the different varieties. Chrysalides are generally vivified by primitive methods: they are put on sheets of paper and warmed in the stove, or wrapped up in rags and warmed, by women who are charged with the care of feeding the worms. Only in some parts of the Caucasus they are vivified in special incubators.

The silkworms are fed in houses, in habitable rooms, which are cleared out for that occasion, or else in garrets or sheds in which the family live stock, hay and straw and other products are generally kept. The worms crawl about the floor, or on lattice work of cane, especially prepared for them. They are fed three times a day, very rarely oftener. At first, their food consists of young leaves and later on, of boughs with leaves; the food plants are changed from 2 to 3 times during the whole period of their feeding, and most often not at all. These and many other irregularities in silkworm culture result from the fact that the growers belong mostly to Asiatic tribes, who keep to their primitive methods and prejudices. The Russian Government long ago directed its attention to these imperfect methods which hinder the development of the silkworm industry, and improvement therein is confidently expected. It organized several administrations, with the aim in full view of improving the modes of culture. Owing to irrational methods the feeding of worms lasts 60 days and sometimes longer, and the harvests of cocoons are very often unsatisfactory. In the governments of southern Russia the worms are fed from the end of April till July, and in the other regions, from the end of March till the end of May or the middle of June.

The most destructive diseases to which silkworms are subject are the pebrine and the pallor; jaundice is a very common malady among silkworms, but is not very fatal. The muscardine occurs sporadically, and that very seldom. The cocoons are often attacked by the larvae, called *dermestes lardarius*, and in the Transcaucasia, by the ant, *crematogaster subdentata*. The crop of cocoons is in most cases from 30 to 60 pounds per ounce of eggs (25 grams). When the harvest is good an ounce of eggs will yield from 90 to 120 pounds, and in excellent seasons, from 150 to 180 pounds.

The total quantity of cocoons harvested amounts yearly to 1,281,000 pouds, which are thus distributed:

South Russian governments . . . . .	1,000 pouds
Caucasus and Transcaucasia . . . . .	320,000 "
Turkestan, Bokhara, Khiva and Transcaspia . .	960,000 "

The prices for raw cocoons fluctuate from 7 to 25 roubles per poud, dependent upon the harvest, species and quality. The usual price per poud of cocoons is as follows: for green Japanese species, from 7 to 10 roubles; for European and Bagdad varieties, from 13 to 18 roubles.

Generally cocoons serve for the home use of the growers, or are unwound by them, and the raw silk sold to dealers. Only in Transcaucasia are the cocoons sold in the crude state. In Bessarabia, in the government of Kiev, in western Transcaucasia, in the Transcaspian regions and in Turkestan, where the cocoons are raised for home use, the silkworm farmers make all sorts of tissues and knitted goods by hand out of the unwound silk. Cocoons in the raw state are sold either to silk factories, or to agents or dealers who dry and then sell them to the manufactories. Cocoons are seldom sold for cash; generally they are given in return for silkworm eggs, or for advance money, and more often in exchange for different goods of home necessity.

The chrysalides in cocoon are killed by the peasants either by putting them in the sun, or by laying them over the steam of their kettles. The agents and the silk winders kill them by steam machines. The cocoons are either dried in the open air, in sheds, in garrets or under roofs. The prices of dried cocoons vary from 33 to 50 roubles per poud. The greatest part of the cocoons, as mentioned above, are unwound by the growers themselves. For this work common and unimproved instruments are used, and the silk thus produced is coarse and commands low prices, as it is only suitable for making cords, for sewing and for ordinary use. The prices of such silk fluctuates from 100 to 180 roubles per poud. About 150,000 pouds of cocoons are unwound yearly by the European method, principally in Transcaucasia where 20 steam machines for unwinding silk are at work, producing from 5,000 to 6,000 pouds of silk, sold to the Moscow silk factories averaging from 250 to 350 roubles per poud. For unwinding cocoons brought from south Russia, a steam machine has been placed along side of the manufactory of Sapozhnikov Brothers, near Moscow. The remains of raw silk, after the unwinding, are not worked up in Russia but are exported, principally to Marseilles. In Transcaucasia and Turkestan silk is twisted by the Asiatic method, in order to produce organzine and tram for tissues; it is twisted by the European method at the silk mills in Transcaucasia. Moreover, there are large machines of Italian and American systems at work in the environs of Moscow, twisting silk of the Chinese, French and Italian sorts.

The greatest part of raw silk, produced in Russia, is used by Moscow and its environs, where all kinds of tissues are fabricated from it and which are sent over all the Empire. Besides the Russian silk, the quantity of which used in Moscow ranges from 12 to 15 thousand pouds, the Moscow mills consume about 40,000 pouds of foreign silk. The rest of the Russian silk is either exported or used elsewhere.

The turnover of the export and import trade in silk varies from 13 to 15 million roubles, of which from 2,000,000 to 2,500,000 roubles belong to the export trade. The total quantity of silk products exported averages from 36,000 to 50,000 pouds, of which silk residues form 64 per cent; cocoons, 21 per cent; raw silk, 11 per cent; silk wares, 3 per cent, and woven silk, 1 per cent. The total quantity of imported products amounts to 50 to 55 thousand pouds, of which undyed, twisted silk, forms 42 per cent, raw silk, 24 per cent; silk goods, 20 per cent; floss silk, 8 per cent; and dyed silk 6 per cent.

For improving and developing the silkworm culture the Government has organized four establishments in Turkestan, the duty of which is to raise healthy and rich silk worms,

and to give general instruction in this branch of industry. Furthermore, there is a similar administration with two divisions in Tiflis, which is likewise devoted to the interests of the silkworm trade, and which pays especial attention to the production of the best grades of cocoons, and instructs growers of silkworms in the best methods of culture to be employed in the Caucasus. These administrations publish yearly accounts of their investigations and conclusions. Moreover, the elementary schools of southern Russia and in the Caucasus, in which the cultivation of silkworms is taught, the zemstvos and committees belonging to the Moscow and Southern Societies of Rural Economy, all tend to the development and improvement of the industry.

The raising of silkworms is closely identified with the growing of mulberry trees. In the Russian Empire two sorts of mulberry trees are raised: the white, *morus alba* L. and the black, *morus nigra* L. The white mulberry tree grows in the whole of European Russia up to the bordering line which passes through St. Petersburg, Moscow, Voronezh, Orenburg and to the Chinese frontier, also in the Amour regions, in Turkestan, in the Transcaspian territory and in the Caucasus, except the highlands, where the climate is very severe. In St. Petersburg the mulberry tree winters under straw coverings, and in Moscow it lives unprotected. In Transcaucasia and Turkestan it may be considered a native tree, as it grows beautifully over all the country and often wild. The black mulberry tree is only cultivated in the Crimea, Transcaucasia, Turkestan and in the Transcaspian regions.

In Transcaucasia and Turkestan there are several species of the white mulberry tree: a. the ordinary variety, with white, violet and black fruit; b. *t e g e r a n - tout*, *b e d a n a*, *s h a k h - tout*, *m a r v a r i t a k*, *b a l k h i* and other species; but principally the *v a r i e t a s t a t a r i c a* and *v a r i e t a s v u l g a r i s* are cultivated. The black mulberry tree has no varieties and is known in Turkestan under the name of *s h a k h - tout* and in Transcaucasia, as *k h a r - tout*. The white mulberry tree is cultivated for its fruit, for the feeding of silkworms and for many other purposes. The black mulberry tree is grown only for its fruit. Owing to the great importance of the white mulberry tree for the raising of silkworms, the Government has always paid great attention to its cultivation. Already the Tsar Alexei Mikhailovich ordered the first plantation of mulberry trees to be made in the environs of Moscow. Thanks to a series of administrative measures a considerable number of mulberry trees were set on the steppes of southern Russia which proved very suitable for such plantations.

The methods of planting these trees are very different, depending on their designation: a. for the feeding of silkworms, the mulberry tree is planted in the southern governments in bushes, as a hedge; in western Transcaucasia it is grown in hedges, and as high trees in fields; in the other parts of the Transcaucasia it grows in low trees, but very close together, from 60,000 to 70,000 trees per dessiatine, the branches being cut off every year; in Turkestan it is planted in the same way; b. for harvesting fruit; if the fruit is wanted for home use, the trees are set separately around the house or in the garden, and if it is gathered for sale, then very high trees are set and grown in large plantations, 220 to 250 pieces per dessiatine.

## CHAPTER XI.

## Rural Economy.

Prices of land, rent, day labour, and wages; cost of cultivating the principal cereals; the economical importance of the chief branches of farming in different regions; variations in profits; the importance of floating capital upon estates; the economic significance of extra earnings of the peasants; the effect that good and bad harvests have upon the peasantry.

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**I**N the preceding chapters are more or less fully discussed, the natural conditions which influence agriculture in Russia, the density of the population, the distribution of land among the peasants, and the different means used by them to make their lands profitable. The results produced by these conditions show varying profits of peasant farming. These profits are not only influenced by the natural conditions, but also by the prices on the products of rural economy, the prices of labour and other circumstances already examined. The prices of landed property give the best idea of its productiveness, as they depend greatly, if not wholly, upon the profits derived from such land

It is somewhat difficult to define the prices of land, and especially the average prices in a given locality. An accurate valuation of land demands a very complicated examination of the locality and of certain arbitrary conditions influencing its productiveness, which are inevitable in defining the profits to be derived therefrom. As to the selling prices, they also cannot be accurately defined as they depend on many unforeseen conditions, such as the straightened circumstances of the seller, the special desires and tastes of the buyer, who often selects pretty scenery and pleasant surrounding rather than especially productive land. Furthermore, estates are sold so seldom that it is not possible to deduce from such transactions an average price for the land of that locality. Nevertheless, to form an idea of the value of land in different places and of the increase during a certain period, it is necessary to compare, in the best way possible, the selling prices. The local landowners have always a more or less definite idea of the average value of the farms and estates in their several localities, and at different seasons. Such information was gathered from 1883 to 1889 by the Department of Agriculture and Rural Economy, with the aid of certain landowners. They give a general idea of the selling prices of land, during the last decade, and of their fluctuations during the last thirty years.

The average prices, at which in a given locality certain estates are sold, are of course of the greatest importance. These prices are fixed only for lands belonging to landowners, as those of peasants can only be sold under certain conditions. Thus, the information given has no reference to such localities as the governments of Archangel, Olonets and Viatka, where there are no private estates, nor to the government of Perm,

where the estates are of a special type representing extensive forest farms, comprising a common estate with the metallurgical works to which they belong.

Map № 1 gives an idea of the prices of land which existed about the years 1889 and 1890. The highest prices, above 100 roubles per dessiatine, are in those parts of the non-steppe Chernoziom region, where the population exceeds 40 to 50 inhabitants per square verst. Here, owing to the natural productiveness of the soil and to the density of the population, the land gives the greatest profits. This region embraces the governments of Podolsk and Kiev, the northern part of Bessarabia and Kherson and spreads further to the north-east, comprising the governments of Poltava and Koursk, and the greater part of Kharkov, Voronezh, Orel, Riazan and Tambov. In some localities of this region, especially in the governments of Kiev and Koursk, the average land prices fluctuate between 150 and 200 roubles per dessiatine, and in some cases it is still higher. In the southern steppe governments, except the region of the Don where the population is very sparse, in most of the non-steppe Chernoziom localities up the Volga, as well as in that strip of land bordering from the north the regions of the highest land prices, and forming the passage from the Chernoziom to the non-Chernoziom regions, the prices exceed 70 roubles per dessiatine; the same high values obtain in the Baltic governments. In some localities of the Moscow trade region and in the governments of Litva, that is, in the non-Chernoziom regions which have comparatively a dense population and where farming as well as trade has much developed, the average prices of land exceed 50 roubles per dessiatine. In the Chernoziom region, to the east of Volga, and in the other non-Chernoziom localities the average prices are nowhere higher than 50 roubles per dessiatine, decreasing in the regions where the population is sparse, to 30 roubles, and in some cases, to 10 roubles per dessiatine.

Thus is the general view of the prices of farms in the different localities of European Russia, by which it is seen how much the density of the population influences the values of such land. This influence is much greater than that produced by the natural qualities of the soil, the development of the ways of communication in the given locality, and by other similar circumstances. By examining the varying prices from 1860 to 1889 the influence upon these values of the density of the population, of the construction of railways and of such other natural factors as cause an advance or a decline in the values of agricultural products, becomes still more visible.

Map № 2 gives a general idea of the advance in the prices of land during the above mentioned years. It shows that they have especially increased in the southern steppe governments; for example, in some localities they have increased fourfold and in the government of Tauride, even fivefold. It should be said, however, that simultaneously with the rise in the value of land the population in these governments as well as the number of railroads rapidly increased. Furthermore, in the south-western, Little Russian and Ufa governments of the non-Chernoziom region, in some of the trade governments, as also in those of Novgorod, Pskov and Vitebsk, the prices have risen threefold, and in some localities even fourfold. In all the other localities of Russia, except the Baltic, Lithuanian and Samara governments, they have increased twofold, and even more. In the government of Samara land is very cheap, owing to the succession of bad crops during late years.

The following table shows the fluctuations in the values of land during the past thirty years. The figures in parentheses are derived from only meagre data.

## PRICES OF LAND IN 1889.

## ~~Chapter XI. Rural Economy~~ Map No. 1.

**PROPERTY OF  
THE NEW YORK WORLD  
RURAL ECONOMY MAP NO. 1  
LITERACY.**



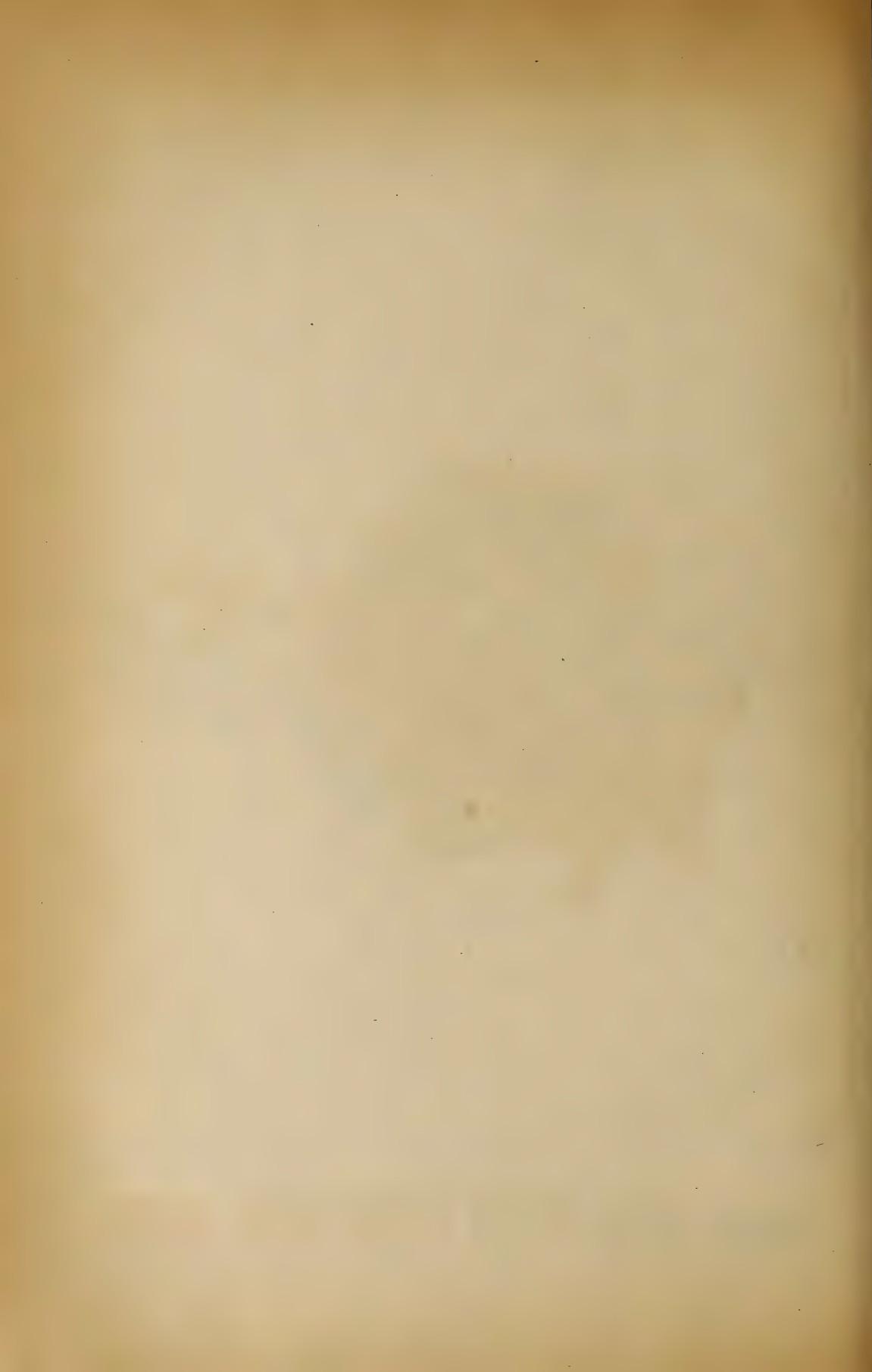
D. Semenov, del.

Cartographical works A. Jlyne St. Pbg.

### Average cost per Crown dessiatine in 1889.

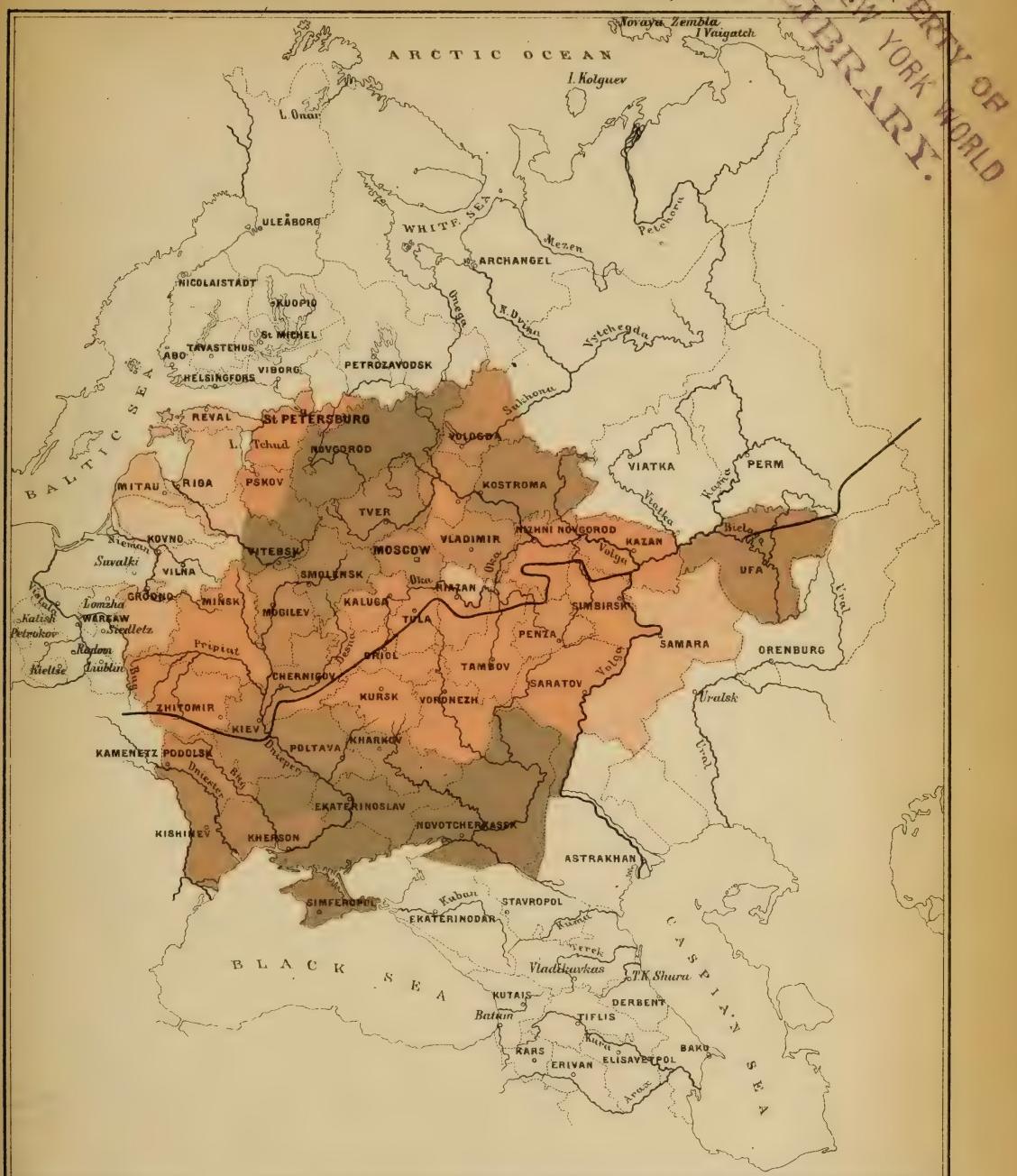


*Less than 10 roubles 10-30 30-50 50-70 70-100 100 roubles and more.*



# INCREASE IN PRICES OF LAND FROM 1860 TO 1889.

Chapter XI. Rural Economy. Map No 2.



D. Semenov, del.

Cartographical works A. Jlyne St. Pbg.

Selling price per dessiatine since the sixties increased to 1889.

50 per cent and less	50-100 per cent	100-150 per cent	150-200 per cent	200-300 per cent	300 per cent and more



Governments.	Average prices of land during the years.			Increase or decrease in land values in per cents.						
	In the six- ties.	In the sev- enties.	1883.	From 1860 to 1870.	From 1870 to 1883.	From 1883 to 1889.	From the sixties to:			
			1889.				1870.	1883.	1889.	
<b>A. CHERNOZIOM GOVERNMENTS:</b>										
Bessarabia.	35	(50)	95	105	43	90	11	43	171	200
Kherson.	29	39	55	94	68	41	70	68	89	224
Ekaterinoslav.	21	33	50	86	57	51	72	57	138	305
Tauride.	14	21	39	76	50	86	96	50	164	442
Don region.	(15)	(27)	(30)	(55)	42	11	78	42	58	266
Kiev.	52	90	142	154	73	58	8	73	173	196
Podolsk.	45	60	120	125	33	100	4	33	166	177
Volyn.	(32)	(49)	(70)	80	53	41	14	53	119	138
Poltava.	35	62	106	106	77	71	0	77	203	203
Kharkov.	35	54	95	104	60	76	9	60	171	197
Voronezh.	40	67	97	93	67	45	— 6	67	142	132
Koursk.	51	94	136	124	84	44	— 9	84	167	143
Chernigov.	33	53	83	87	60	121	5	60	151	164
Orel.	43	81	109	91	84	34	—17	84	153	112
Tula.	41	75	116	95	83	56	—18	83	183	132
Riazan.	50	85	115	100	70	35	—13	70	130	100
Tambov.	43	79	113	93	84	43	—17	84	163	118
Penza.	36	69	100	77	91	45	—23	91	179	114
Kazan.	30	50	72	72	33	44	0	33	140	140
Simbirsk.	32	62	94	76	94	51	—19	94	162	138
Saratov.	29	46	65	59	59	41	—15	59	124	103
Samarra.	17	21	36	32	23	71	—11	23	118	89
Ufa.	10	(15)	27	36	50	80	33	50	170	260
Average.	33	55	85	90	66	54	6	66	157	173
<b>B. NON-CHERNOZIOM GOVERNMENTS:</b>										
Moscow.	15	(35)	40	41	133	13	2	133	166	173
Tver.	14	(26)	42	44	85	61	5	85	200	214
Vladimir.	22	—	48	59	—	—	23	—	114	168
Yaroslav.	13	18	35	33	38	94	—6	38	170	154
Smolensk.	11	(23)	32	39	109	39	22	109	191	254
Kalouga.	22	(28)	44	49	28	57	11	28	100	123
Kovno.	46	77	87	65	67	13	—25	67	89	41
Vilno.	31	(41)	56	50	32	36	—20	32	81	45
Grodno.	(34)	(65)	(74)	(58)	91	13	—22	91	111	71
Vitebsk.	16	27	39	47	69	44	20	69	143	193
Mogilev.	10	14	25	28	40	78	12	40	150	180
Minsk.	13	20	30	38	54	50	27	54	130	192
Nizhni-Novgorod.	30	44	83	63	46	88	—23	46	176	110
Kostroma.	8	10	21	30	25	110	43	25	162	275
St. Petersburg.	(16)	(16)	34	37	0	112	10	0	112	118
Pskov.	17	(30)	40	70	76	33	75	76	135	312
Novgorod.	5	7	14	26	40	100	85	40	180	420
Livonia.	50	64	100	81	28	56	—19	28	100	62
Courland.	(69)	(95)	112	(95)	37	18	—15	37	62	37
Estonia.	(45)	(51)	87	77	13	70	—11	13	93	71
Average prices.	24	36	52	51	50	44	— 2	50	117	112
Of 43 governments.	28	45	68	71	61	51	4	61	143	153

From the above table it is seen that the values of land increased regularly and rapidly in all the governments from 1860 to 1883, and that from 1883 to 1889 the total increase was much slower owing to the great depreciation in the values of the principal cereals. During the latter period above mentioned the values of land in some governments, as for instance in the southern steppes, increased very rapidly, and in others, they declined. By examining more carefully the regions where the land values decreased, it will be noticed that during the period from 1883 to 1889, in those localities where the predominating cereals were rye and oats, the decrease in land values was the greatest, and that for the past five or six years the decline was very considerable. In 1891, owing to very bad crops in general over an extensive area, the prices of all cereals and foodstuffs increased very greatly.

In Chapter III, Vol. I, this work, it is said that in many localities of Russia it is the custom to rent to peasants several dessiatines of land per season. In general, land for the sowing of winter cereals is rented at a higher price than that for spring crops, except in those regions where the cultivation of spring wheat is especially general. The rent price of land for winter crops fluctuates from 3 to 25 roubles, in some cases amounting to 30 roubles per dessiatine; for spring sowings, farm rentals fluctuate from 3 to 20 roubles per dessiatine. In general, rent of land is the dearest in localities where the prices of agricultural products are the highest, and where the inhabitants are the most thickly settled. In such regions, where the selling price of land exceeds 75 and 100 roubles per dessiatine, the rental per season fluctuates between 10 and 15 roubles. In localities where land is cheap, the rental is correspondingly low, although in such parts of the Chernoziom region as are sparsely settled the selling prices of land decrease more rapidly than that of the rentals, the reason being that only tillable lands, which always cost more than other appanages, in localities where the prices of land are low are rented for one crop only. Thus, in the steppe Chernoziom regions, as well as in the non-Chernoziom localities of Russia, the rent prices per winter or spring crop is seldom lower than 5 roubles per dessiatine, fluctuating generally between 5 and 10 roubles. When land is rented for one season for some special crop, as for example, flax in the non-Chernoziom region, or for kitchen gardens and melon fields in the Chernoziom region, the price for land reaches its maximum, 40 to 50 roubles per dessiatine. When land is rented for a longer period the rental and selling prices are more nearly parallel to each other. The former vary from 4 to 6 per cent of the latter, and fluctuate from 50 kopecks to 15 roubles per dessiatine. On the whole, even in the most populated parts of the Chernoziom region they seldom exceed 8 to 10 roubles, falling sometimes to 4 roubles per dessiatine. It must be observed, however, that the renting of lands for a long period occurs in Russia much more seldom than in Western Europe. The total area of lands rented by the year or by the crop, is not more extensive than that rented for a long period, even if the Government quit-rents and lands belonging to the Crown (Chapter III), which are always rented for long periods, be not taken into consideration.

The best method for acquiring an idea of the productiveness of the soil in Russia is to examine the rental and selling prices of land. These prices, of course, do not include the profits of the middleman and the interest on the floating capital. Furthermore, they only show the ordinary average profits which the land gives, without indicating the great fluctuations of these profits in some localities of Russia,

dependent upon the crops and the irregular prices of labour. In Chapter III, different methods of utilizing the estate lands were discussed, as also the principal ways of employing the workmen. From what was said in that chapter, it may be seen that labour in Russia is hired in two different ways, either for the execution of a certain piece of work, paying the workman as soon as the job is finished, or for a definite period, by the month or the year.

In the first instance, the workman is hired to fully cultivate one dessiatine of land for winter or spring crops, or for both. Such labour includes the ploughing of the fields, twice or three times, the sowing and the harvesting, but not the removal of the crop from the field nor the thrashing of it. All such work the peasant must do with the aid of his own horse and instruments, and must furnish his own living. The proprietor furnishes only seed for the sowing, inspects the work and pays the wages of the workman. This practice is especially general in the non-steppe, densely populated portions of the Chernoziom region, namely, in the Central Agricultural Region, and represents the cheapest method of cultivating land, although the landowners have generally to pay their workman in advance. In the aforesaid governments the payment for such tillage per dessiatine of winter or spring crops fluctuates between 6 and 7 roubles, and in some cases, between 4 and 10 roubles. Such cheap labour, which forms from one-third to two-thirds of the wages paid to workmen, if hired by the day, can be explained by the circumstances that the greatest part or the whole of the money is paid to the workman in advance, although at a small per cent, and that the landowner runs the risk of having the work badly done or not done at all. The prices of labour hired in such way are very constant, which is a great advantage. Sometimes the workmen are engaged to do certain work by the job, as for example, the ploughing, or the harrowing, the reaping or the mowing; in such cases the men are engaged only a few days in advance and paid immediately after the work is finished. This method of hiring labour is very general, and the prices paid are dependent upon the number of hands seeking work and upon good or bad crops, and fluctuate considerably. As the work is of various sorts the prices, of course, also vary according to the kind of labour, the locality and the season.

There are three different systems of hire in Russia: 1. by the year; 2. by the season or by the month; 3. by the day or by the job. The workmen hired by the year or by the season generally live on the estate and in addition to their monthly wages they are boarded and lodged. When they are hired by the day they are sometimes given their meals, but more generally such expenses are deducted.

The hiring of workmen by the year is common in Russia, but more especially in the Baltic, Vistula and some western governments, where it is the predominating method. The wages paid to year workmen fluctuate very little. In some cases, depending upon the capability of the labourer, sex and age, wages vary considerably; the most expensive workmen are specialists, such as coachmen, gardeners, kitchen gardeners, machinists, and the like. According to information gathered by the Department of Agriculture and Rural Economy, the average prices in the different governments, paid to adult workmen during late years, were as seen in the following table.

It is seen from the next table that the highest yearly wages are paid to workmen in the southern steppe, the Baltic and trade governments, and the lowest, in the Lithuanian and Belorussk, of the non-Chernoziom region, and in the south-western and central agricultural governments of the Chernoziom. In the latter region labour is cheapest where

G o v e r n m e n t s :	Annual wages.		Annual cost of food per workman.	Total annual cost.	
	Man.	Woman.		Man.	Woman.
	R o u b l e s .				
<b>1. SOUTHERN STEPPE:</b>					
Bessarabia . . . . .	85	40	39	124	79
Kherson . . . . .	80	43	50	130	93
Tauride . . . . .	104	54	59	163	103
Ekaterinoslav. . . . .	84	44	44	128	88
Don region . . . . .	90	44	40	130	84
<b>2. SOUTH-WESTERN:</b>					
Kiev. . . . .	51	25	40	91	65
Podolsk . . . . .	44	33	34	78	67
Volynia . . . . .	30	26	40	70	66
<b>3. LITTLE RUSSIA:</b>					
Kharkov . . . . .	63	36	42	105	78
Poltava . . . . .	60	36	37	97	73
Chernigov . . . . .	50	30	40	90	70
<b>4. CENTRAL AGRICULTURAL:</b>					
Voronezh. . . . .	57	35	42	99	77
Koursk. . . . .	55	31	38	93	69
Orel. . . . .	49	27	43	92	70
Tula. . . . .	51	27	41	88	68
Riazan. . . . .	51	28	43	94	71
Tambov . . . . .	54	32	41	95	73
<b>5. CENTRAL VOLGA:</b>					
Simbirsk . . . . .	56	32	42	98	74
Saratov . . . . .	66	37	40	106	77
Penza . . . . .	52	27	43	95	70
Kazan . . . . .	48	29	42	90	71
Nizhni-Novgorod . . . . .	57	30	47	104	77
<b>6. NIZHNI-VOLGA:</b>					
Samara . . . . .	65	33	38	103	71
Orenburg. . . . .	54	25	36	90	61
Astrakhan . . . . .	87	44	45	132	89
<b>7. TRADE REGIONS:</b>					
Vladimir . . . . .	75	32	52	127	84
Moscow . . . . .	75	37	55	130	92
Kalouga . . . . .	57	30	48	105	78
Tver. . . . .	70	40	50	120	90
Yaroslav . . . . .	75	41	43	118	84
Kostroma. . . . .	75	42	48	133	90

G o v e r n m e n t s .	Anual wages.		Annual cost of food per workman.	Total annual cost.	
	Man.	Woman.		Man.	Woman.
	R o u b l e s .				
<b>8. WHITE RUSSIA:</b>					
Moghilev . . . . .	47	27	44	91	71
Minsk . . . . .	45	25	40	85	65
Vitebsk . . . . .	50	27	47	97	74
Smolensk . . . . .	46	29	44	100	73
<b>9. URAL:</b>					
Viatka . . . . .	50	28	45	95	73
Ufa . . . . .	50	28	38	98	66
Perm . . . . .	50	27	45	95	73
<b>10. NORTHERN:</b>					
Vologda . . . . .	60	35	48	108	83
Archangel . . . . .	55	34	50	105	84
<b>11. LAKE:</b>					
Olonets . . . . .	75	40	55	125	95
Novgorod . . . . .	75	40	50	125	90
St. Petersburg . . . . .	102	60	65	167	125
Pskov . . . . .	58	34	50	108	84
<b>12. LITHUANIA:</b>					
Vilno . . . . .	45	25	47	92	72
Kovno . . . . .	43	25	50	93	75
Grodno . . . . .	37	25	47	84	72
<b>13. BALTIC:</b>					
Livonia . . . . .	80	35	60	140	95
Courland . . . . .	90	40	65	155	105
Estonia . . . . .	75	35	65	140	100

the population is thickest; and dearest in the sparsely populated districts. In the non-Chernoziom regions the wages paid to workmen are influenced not only by the ratio of the population but by the development of the non-agricultural industries. As to the food for workmen, the cost thereof is in close relation to the local prices of bread, and as the workmen get the same food as the peasants in the given locality, its cost depends greatly upon what forms the food of the peasants themselves, whether bread, meat, milk or other foodstuffs. In general, in localities rich in bread, as for example the Chernoziom region, the food for the workmen is cheapest in those places farthest from the ports, as the Nizhni-Volga governments, and dearest in the southern steppe governments which are nearest to the Black Sea. In the non-Chernoziom governments the food for workmen is dearest in the Baltic governments nearest to the export points of cereals, and in those which are not rich in bread and far removed from the grain districts.

Workmen are often hired monthly, but still oftener for the summer, of about five months. This method of hire is practised everywhere, more or less, and is the principal mode in sparsely populated localities of the Chernoziom region, where great numbers of

workmen come from other places. As in the Chernoziom region, where the population is agricultural, the demand for workmen is much greater in summer than in winter, the wages paid to workmen hired for five months are excessively high, compared with those paid to the year workman. The summer hand receives generally about two-thirds of the wages paid to the labourer who is hired by the year and sometimes more than that. Thus on the average a year workman receives in the government of Koursk 55 roubles, and a summer hand, 39 roubles; and in the government of Riazan a year labourer gets 51, and a summer workman, 35 roubles. In some cases summer hands get as much as those hired by the year, consequently, a peasant engaged for the whole year finds it advantageous to live on the estate and work for the proprietor for his board and supplies. In such regions, where non-agricultural trades are practised the difference between the wages paid for labour hired by the year and by the season is much more considerable; thus in the Moscow government a workman hired by the year receives 75, and one, by the season, 45 roubles, and in the government of St. Petersburg, 102 and 60 roubles respectively.

Workmen are hired by the day over all Russia, but nowhere is such a practice predominant. In agricultural labour, daily workmen generally do the reaping, harvesting and thrashing; furthermore, they are hired for general work when the number of the year or summer hands, as well as of those hired by the job is insufficient. Nevertheless, it is interesting to examine the wages of day labourers, as being paid for an equal amount of work and an equally short period, they show most clearly the smaller or greater demands for workmen, influenced by the seasons and by different years. There are two classes of daily workmen: simple hands, and those who furnish their own teams and instruments; the wages paid to them vary and are dependent on the sex, age and ability of the labourer. The Department of Agriculture and Rural Economy annually gathers information on the different wages paid to day workmen, and finds that this difference depends not only on the sex and age of the workman, as already mentioned, but also on the following circumstances: whether the labourer is boarded and lodged; whether he is hired for the spring sowings, for summer work, for the harvest, or for autumn, or at the end of summer during the close of the harvesting. From the material gathered by the Department during 12 years, many interesting conclusions may be drawn.

The wages paid to day labourers, who have their own teams and instruments, exceed that paid to simple hands from one-third to one-half. The same difference exists between the prices paid to men and to women. The average wages in spring during the sowing, are everywhere considerably lower than those paid during haymaking and cereal harvest. In some of the non-Chernoziom regions, where ploughed lands occupy small areas, the highest wages are paid to day workmen during haymaking, and in others, especially in all Chernoziom regions, being from two to threefold higher than the spring wages, they are paid during the harvesting of cereals, when the prices are from two to three times higher than at seedtime. The following table gives a general view of the average prices in the different governments, from 1882 to 1891, also of their yearly fluctuations and of the difference between day labour in spring, and in the harvest season. In order to show the greatest fluctuations in the wages of the day labourer the last column of the table is made to show the highest and the lowest prices paid. The data have been derived by the Department of Agriculture and Rural Economy from the information given by different farmers.

Average wages paid for day labour in the different governments  
of the Empire from 1882 to 1891.

Governments.	During spring sowing.		During hay- making.		During har- vest of cere- als.		Differences.			
	Average.		Yearly fluctua- tions.		Average.		Yearly fluctua- tions.		Between sowing and harvest time.	
	I	n	k	o	p	e	c	k	s.	
<b>1. SOUTHERN STEPPE:</b>										
Bessarabia . . . . .	53	35—70	64	45—85	84	70—120	31	50	21	300
Kherson . . . . .	40	35—70	58	45—90	128	65—250	88	185	20	500
Tauride. . . . .	54	50	60	102	95—110	132	80—275	78	195	20—500
Ekaterinoslav . . . . .	39	35—60	65	50—90	107	60—280	68	220	25	500
Don region . . . . .	50	35—70	70	30 150	124	75 230	74	145	15	400
<b>2. SOUTH-WESTERN:</b>										
Kiev . . . . .	33	25—35	52	45—65	57	45—70	24	25	15	300
Podolsk. . . . .	32	27—35	50	40—65	58	50—75	26	25	20	150
Volyn. . . . .	31	30—35	46	40—50	47	45—50	16	5	15	100
<b>3. LITTLE RUSSIAN:</b>										
Kharkov . . . . .	36	30—40	55	50—65	78	55—125	42	70	20	300
Poltava. . . . .	33	30—35	48	45—50	63	50—90	30	40	20	250
Chernigov. . . . .	35	30—40	61	55—75	53	45—60	18	15	15	125
<b>4. CENTRAL AGRICULTURAL:</b>										
Voronezh . . . . .	35	30—40	57	50—70	68	45—95	33	50	25	200
Kursk . . . . .	34	30	40	52	45—60	64	55—80	30	25	15—200
Orel . . . . .	33	30—40	46	45—50	49	45—65	16	20	15	200
Tula . . . . .	37	30—40	54	50—60	59	50—70	22	20	15	150
Riazan . . . . .	38	35—40	56	50—60	63	45—70	25	15	15	180
Tambov. . . . .	33	30	37	50	45—55	49	55—60	16	15	10—150
<b>5. CENTRAL VOLGA:</b>										
Simbirsk . . . . .	36	35—40	57	50—65	56	40—75	20	35	20	200
Saratov . . . . .	41	35—50	58	50—75	66	50—110	25	60	15	300
Penza . . . . .	31	30	35	50	45—55	48	40—60	17	20	15—120
Kazan . . . . .	36	35—40	53	50—60	48	40—60	12	20	20	100
Nizhni-Novgorod. . . . .	42	35—45	62	55—70	58	55—60	16	5	20	150
<b>6. NIZHNI-VOLGA:</b>										
Samara. . . . .	38	35—45	60	50—70	66	50—95	28	45	15	250
Orenburg. . . . .	40	30	60	60	30—110	69	60—90	29	30	25—150

Governments.	During spring sowing.		During hay-making.		During harvest of cereals.		Difference.	
	Average.	Yearly fluctuations.	Average.	Yearly fluctuations.	Average.	Yearly fluctuations.	Between sowing and harvest time.	Maximum and minimum sowing and harvest time.
	I	n	c	o	p	e	c	s.
<b>7. TRADE DISTRICTS:</b>								
Vladimir . . . . .	51	45—55	77	65—90	63	55—75	12	20 20—150
Moscow . . . . .	49	45—50	65	60—70	65	60—70	16	10 25—180
Kalouga . . . . .	40	35—45	63	60—70	64	55—70	24	15 20—200
Tver . . . . .	46	40—55	60	55—70	55	50—65	9	15 20—125
Yaroslav . . . . .	61	55—70	67	60—75	66	60—70	5	10 30—150
Kostroma . . . . .	47	40—60	56	50—65	51	44—55	4	10 20—175
<b>8. WHITE RUSSIA:</b>								
Moghilev . . . . .	38	35—40	55	50—65	50	45—55	12	10 20—100
Minsk . . . . .	34	30—35	47	45—50	48	45—50	14	5 15—100
Vitebsk . . . . .	44	40—50	55	50—60	53	50—60	9	10 20—100
Smolensk . . . . .	44	40—45	61	55—70	56	55—60	12	5 25—150
<b>9. URAL REGIONS:</b>								
Viatka . . . . .	37	30—40	47	40—55	43	40—55	6	15 15—100
Ufa . . . . .	34	30—40	48	40—60	48	35—60	14	25 20—100
Perm. . . . .	47	45—55	52	50—55	53	50—55	6	5 15—100
<b>10. NORTHERN:</b>								
Vologda . . . . .	49	45—55	63	60—65	53	50—55	4	5 30—140
Archangel . . . . .	72	40—100	76	70—85	73	65—80	1	15 20—150
<b>11. LAKE:</b>								
Olonets . . . . .	56	40—60	76	70—85	67	60—80	11	20 20—150
Novgorod . . . . .	49	45—55	68	65—70	58	50—70	9	20 25—150
St. Petersburg. . . . .	58	55—65	81	75—95	68	55—80	10	25 30—150
Pskov . . . . .	46	40—55	63	55—70	57	55—65	11	10 30—140
<b>12. LITHUANIAN:</b>								
Vilno. . . . .	38	35—40	48	45—50	43	40—45	5	5 20—100
Kovno . . . . .	47	45—50	55	50—60	54	50—65	7	15 20—120
Grodno . . . . .	29	25—30	42	38—50	41	35—50	12	15 12—80
<b>13. BALTIc:</b>								
Livonia. . . . .	59	55—65	66	65—70	63	60—70	4	10 25—200
Courland . . . . .	63	60—70	74	70—80	68	65—70	5	5 35—160
Estonia . . . . .	57	50—65	65	60—80	69	58—70	12	12 35—120

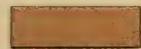
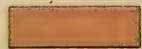
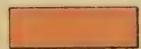
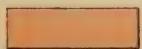
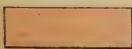
YEARLY AVERAGE PRICES DURING THE TEN YEARS FROM 1882 TO 1891  
ALLOWED IN HARVEST TIME TO DAY WORKMEN FOR THEIR BOARD.

## Chapter XI. Rural Economy Map No. 3.



Del. S. A. Korolenko.

**Cartographical works A. Jlyne S.P.B.**



*From 41 to 49 kopecks. From 50 to 59 kopecks. From 63 to 69 kopecks. From 73 to 84 kopecks. From 1 or to 1,32 roubles.*



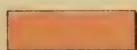
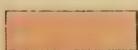
FLUCTUATION OF THE AVERAGE PRICES, DURING THE 10 YEARS  
FROM 1882 TO 1891, ALLOWED IN HARVEST TO DAY WORKMEN FOR THEIR BOARD.

Chapter XI. Rural Economy, Map № 4.



Del. S. A. Karolenko.

Cartographical works A. Jlyne S.P.B.



From 5 to 12 kopecks. From 15 to 20 kopecks. From 25 to 30 kopecks. From 35 to 70 kopecks. From 1.55 to 2.20 roubles.



Map № 3, annexed to the above table, shows the average price paid to simple hands during harvest in the different localities; Map № 4, the yearly fluctuations in such prices during the said ten years. The above table shows that the day wages during spring sowings is rather low and does not differ much, neither in the different localities nor in different seasons. The difference between the lowest price in the government of Grodno, 29 kopecks, and the highest, in the government of Arkhangel, 72 kopecks, does not exceed 43 kopecks. The yearly fluctuations of daily wages in spring do not generally exceed 10 or 15 kopecks, and only in some new Russian governments do these differences amount to 35 kopecks. The highest day wages during spring sowings are paid in the Baltic, St. Petersburg, Olonets, Yaroslav and Archangel governments; next come the non-Chernoziom governments and the southern steppes. The lowest wages for daily labour is in spring, in that part of the Chernoziom regions which is the most densely populated, and also in the Minsk and Grodno governments.

During haymaking these prices rise considerably, generally from 10 to 20 kopecks, and in some steppe governments, to 40 kopecks and more. The fluctuations become also from year to year more considerable, ranging from 20 to 30 kopecks. Nevertheless the difference in the day wages of different localities is still not very great, and only in the southern steppe and trade governments does it amount to the same as in the Baltic and northern governments. Only towards the end of summer, during harvest time, are the day wages subject to great changes.

In all the governments which lie north of the Moscow parallel, except a very few, the day wages during harvest exceed those paid during the putting in of spring crops not more than 10 kopecks on the average. In the south this difference becomes more considerable. In all the Chernoziom governments the harvest price exceeds that of spring sowings 20 kopecks; in other words, the harvest wages in the southern regions are about one and one-half times higher than the spring wages. In the steppe regions this difference is still greater, amounting in the southern governments, as in the greatest part of Novorossisk, to 70 and 80 kopecks; here the prices in autumn become twofold and threefold those of the spring. As is seen on Map № 3, the highest daily wages during cereal harvesting is in the south of Russia. In all the governments of Novarussia, except Bessarabia, they exceed one rouble; further north they are less and in central Russia, on the borders of the Chernoziom and non-Chernoziom regions, they attain their minimum at 40 to 50 kopecks; some central agricultural and trade governments form an exception, where the wages in harvest time are more than 60 kopecks per day. Northward from central Russia they rise again, exceeding 60 kopecks in the Baltic, St. Petersburg and Olonets, and amounting to 73 kopecks in the Archangel governments.

The fluctuations of the autumn day wages during harvest are of great interest and importance, as they define the difference existing over all Russia in the expenses of landowners, as also in the earnings of the peasants. As seen on Map № 4, these fluctuations are not great beyond the borders of the Chernoziom regions, where in most parts they do not exceed 12 kopecks, amounting in some governments to 20, and in St. Petersburg, to 25 kopecks. In the Chernoziom region, on the contrary, only in a few governments these fluctuations are 15 to 20 kopecks; in most parts they exceed 25 kopecks, and in the south-steppe governments they amount to 1.55 to 2.20 roubles. In other words, in more than half of the Chernoziom governments, the prices paid to day workmen during

harvest time may exceed the ordinary hire by one-half, twice, three times, or even more according to circumstances, or they can be less.

It has been already mentioned that the profits gained by farming depend on many factors which influence the amount of the different expenses and incomes. The total profit is formed of the incomes which its different branches give. The principal of these, agriculture and cattle raising, must exist even on the smallest farms. On large and complicated farms, besides these two industries, there are many others, for example forestry, gardening, kitchen gardening, different manufactories, where agricultural products are worked, such as distilleries, beet sugar, starch, and treacle fabrics, and cheese and butter dairies. On the different relations and complications of these branches depends the welfare of the estate. It is difficult to calculate the total expenses and total incomes of such estates, and is only possible in separate concrete instances.

It is even difficult to calculate the profits produced by the separate branches of farming, as the expenses on various farms are not uniform, and the receipt books of every farm are kept in different ways. It is also impossible to calculate the total average of separate branches of farming, as for example agriculture, on several estates of a whole region, as the gross receipts produced by each cereal and the expenses of its cultivation are very various on different estates. In 1888 the Department of Agriculture and Rural Economy, owing to numerous complaints on the farming crisis which was influenced by the fall of prices of all the principal cereals at the end of the eighties, attempted to define the average profits and advantages produced by the cultivation of the principal crops. For that aim were composed detailed programs concerning the profit and loss of the production of the principal cereals. Each farm had to show in these programs the average harvest of each cereal during the last 3 to 10 years, as also the average price per poud of that cereal during the last 5 years. By multiplying these two data the gross receipts per dessiatine were obtained. The cost of straw was not taken into consideration.

Some inevitable arbitrary omissions were admitted for each separate account, as follows: 1. as to fertilizing, only the expenses of transporting the manure to the fields were calculated without mentioning the value of the manure itself; as in calculating the profits, the value of the straw was also omitted; 2. the total estate expenses, such as of administration, of reparation, of inventory, and of all sorts of buildings, were distributed equally per number of dessiatines sown; and in reality a great part of these expenses are covered by the incomes gained from the other branches of farming and from unsown lands; 3. the expenses per dessiatine of winter fields were taken double, as it was considered that when the field remains fallow it brings in nothing, which is an evident fallacy, as fallow land in many localities serves as pasture for cattle, and is sometimes sown with fodder plants, as tare for example.

Such programs were sent to the estate owners, correspondents of the Department, and more than 1,000 answers were received. In working data from the material thus obtained it was taken into consideration what part of a winter field and for what cereal it is manured in a given locality; and the cost of the transport of the manure was distributed over all the area sown with winter cereals; as to spring fields, which are very seldom manured, the transport of manure was not counted. Thus, a whole row of figures which give an idea of the comparative average profits of the cultivation of the principal cereals in extensive regions, was obtained and is to be seen in the following table.

Winter cereals.

R e g i o n s.		A m o u n t o f t h e h a r v e s t , a v e r a g e p r i c e t h e 4 y e a r s , 1885-1888 .										P r o f i t s .	
T r a n s p o r t o f m a n u r e .	P l o u g h i n g , s o w - i n g a n d c a r e d u r i n gg r o w t h .	C o s t o f g r a i n .	H a r v e s t i n g a n d t r a n s p o r t f r o m f i e l d .	T h r a s h i n g a n d c l e a n i n g .	R e p a r t i s a n d r e n e g o c i a t i o n s , a n d i m p l e m e n t s .	A d m i n i s t r a t i v e e x p e n s e s .	T o t a l e x p e n s e s .	R e n t p a i d p e r s e a s o n .	P o u d d u r i n g t h e 4 y e a r s ,	A m o u n t o f t h e h a r v e s t ,	P r o f i t s .		
1. New Russia . . . . .	-	6·62	3·37	6·99	4·88	1·26	1·57	0·47	25·16	5·83	0·49	53·90	
2. South-western . . . . .	8·38	3·95	5·37	4·43	1·70	2·70	0·68	29·39	8·77	0·48	44·15	14·78	
3. Little Russia . . . . .	6·97	3·60	5·91	4·41	2·09	1·58	0·82	30·73	8·91	0·44	38·07	7·25	
4. Central agricultural . . . . .	4·51	3·91	4·22	2·81	1·82	1·84	0·82	22·41	11·84	0·43	34·70	12·29	
5. Central Volga . . . . .	4·86	3·54	4·85	2·30	1·10	1·25	0·64	22·12	9·36	0·41	26·50	4·38	
6. Nizhni-Volga . . . . .	5·01	3·41	4·42	2·27	1·30	1·55	0·32	19·53	4·20	0·40	20·35	0·82	
7. Trade . . . . .	7·15	8·60	6·82	6·67	4·54	2·10	0·47	38·35	6·45	0·63	46·48	8·13	
8. White Russia . . . . .	6·82	6·27	5·11	4·30	3·51	2·14	2·20	0·43	30·78	6·40	0·70	40·50	8·72
9. Ural . . . . .	10·60	6·20	5·30	6·10	3·15	1·70	2·00	0·20	35·25	3·30	0·51	37·25	2·00
10. Northern . . . . .	6·14	9·36	7·80	7·23	5·33	1·85	1·10	0·05	38·86	-	0·72	53·76	14·00
11. Lake . . . . .	8·10	9·98	6·60	6·65	4·74	2·41	2·50	0·50	41·48	7·20	0·76	54·00	12·52
12. Lithuanian . . . . .	5·58	7·31	5·45	3·80	3·00	2·68	2·50	0·48	30·80	6·70	0·59	34·70	3·90
13. Baltic . . . . .	9·51	9·17	9·08	6·73	5·03	2·76	3·61	1·25	47·14	11·60	0·74	62·07	14·93
14. Vistula . . . . .	5·00	11·50	7·30	4·75	4·80	3·40	2·60	3·80	43·15	9·25	0·66	48·18	5·03
W i n t e r s .		R	i	n	t	e	r	w	h	e	a	t.	
1. New Russia . . . . .	0·37	8·23	6·27	7·83	6·14	3·55	32·18	6·81	0·85	61·99	29·81		
2. South-western . . . . .	11·13	9·87	7·07	5·30	5·08	45·45	8·93	0·82	73·18	27·73			
3. Little Russia . . . . .	10·20	8·43	6·89	7·05	5·53	43·41	9·75	0·81	77·45	34·04			
4. Central agricultural . . . . .	9·93	6·29	8·43	4·93	3·37	4·24	37·19	13·69	0·87	75·27	38·08		
5. White Russia . . . . .	6·71	9·00	9·05	4·00	3·90	5·75	38·41	7·37	0·88	60·86	22·45		
6. Lithuanian . . . . .	7·00	8·75	9·07	4·39	3·42	5·64	38·27	6·80	0·90	61·05	22·78		
7. Baltic . . . . .	11·40	11·60	14·50	7·60	7·35	7·25	59·70	12·60	0·92	82·80	23·10		
8. Vistula . . . . .	12·15	13·60	12·65	5·75	5·95	9·95	59·80	10·40	0·95	85·50	25·70		

## Spring cereals.

Regions.	Ploughing, sowing and care of crop.		Cost of grain.		Harvesting and transporting from field.		Thrashing and cleaning of the grain.		Repairing, insuring of buildings, paying of debts, administration expenses and land taxes.		Total expenses.		Rent paid per season.	Average price per pound during 4 years, 1885 to 1888.	Amount of the harvest.	Profits.		
			S p r i n g   w h e a t .															
			R o u b l e s .															
1. New Russia . . . .	7.56	6.00	7.45	5.19	3.19	29.39	6.12	0.85	49.00	19.61								
2. South-western . . . .	6.05	8.17	5.17	3.63	4.59	27.61	7.12	0.70	41.25	13.64								
3. Little Russia . . . .	7.26	7.21	5.84	4.93	4.42	29.66	7.36	0.72	52.66	23.00								
4. Central agricultural.	6.14	7.00	4.93	4.31	3.46	25.84	8.60	0.81	46.61	20.77								
5. Central Volga . . . .	5.35	7.28	4.15	2.65	2.37	21.80	7.40	0.74	40.36	18.56								
6. Nizhni-Volga . . . .	6.50	7.20	5.95	3.15	2.96	25.76	6.00	0.79	49.81	24.05								
7. White Russia . . . .	7.96	7.11	3.70	2.70	3.60	25.07	5.03	0.77	40.11	15.04								
8. Ural . . . . .	5.24	10.08	6.50	3.04	3.00	27.76	2.10	0.73	45.00	17.14								
9. Northern . . . . .	4.10	6.35	4.18	2.52	1.15	18.30	—	0.87	61.86	43.56								
10. Lithuanian . . . . .	8.45	9.12	3.92	3.10	5.20	29.79	6.00	0.79	49.60	19.81								
O a t s .																		
1. New Russia . . . . .	7.06	3.50	6.30	4.02	3.19	24.07	5.34	0.47	30.55	6.18								
2. South-western . . . .	5.65	4.33	4.45	3.32	4.74	22.49	7.30	0.45	35.92	13.43								
3. Little Russia . . . .	5.32	3.84	5.03	3.80	4.10	22.09	7.06	0.42	28.74	6.65								
4. Central agricultural.	4.34	4.55	3.04	2.20	4.04	18.17	8.90	0.41	27.55	9.38								
5. Central Volga . . . .	4.65	3.50	3.71	2.30	2.70	16.86	7.40	0.34	20.68	3.82								
6. Nizhni-Volga . . . .	4.68	4.30	3.90	2.58	3.05	18.51	3.30	0.39	20.80	2.29								
7. Trade . . . . .	6.90	7.45	5.07	4.06	4.22	27.70	5.00	0.49	34.46	6.76								
8. White Russia . . . .	6.30	6.39	3.61	3.10	4.55	23.95	5.34	0.49	29.29	5.34								
9. Ural . . . . .	4.26	5.75	5.79	2.81	3.50	19.30	2.10	0.37	20.38	1.08								
10. Lake . . . . .	7.66	8.58	5.66	3.87	4.10	29.87	5.57	0.58	37.13	7.26								
11. Lithuanian . . . . .	6.38	5.94	2.97	2.29	5.05	22.63	5.30	0.54	27.71	5.08								
12. Baltic . . . . .	9.13	9.00	5.88	4.20	5.15	33.36	8.50	0.71	49.05	15.69								
13. Northern . . . . .	4.35	8.18	5.90	4.87	3.00	26.30	6.10	0.49	33.07	6.77								
14. Vistula . . . . .	8.25	7.00	4.40	3.70	7.90	31.25	7.00	0.64	40.96	9.71								
B a r l e y .																		
1. New Russia . . . . .	6.98	3.46	6.21	3.92	3.19	23.76	5.34	0.45	31.90	8.14								
2. South-western . . . .	6.40	5.17	4.71	3.43	4.74	24.45	7.30	0.46	38.43	13.98								
3. Little Russia . . . .	5.72	4.14	5.37	4.11	4.10	23.44	7.06	0.42	31.57	8.13								
4. Nizhni-Volga . . . .	4.15	4.07	3.90	2.40	3.05	17.57	3.30	0.46	19.32	1.75								
5. Trade . . . . .	7.69	6.47	4.51	4.05	4.22	26.94	5.00	0.63	43.90	16.96								
6. White Russia . . . .	7.02	5.31	3.92	3.36	4.55	24.16	5.34	0.60	35.63	11.47								
7. Ural . . . . .	6.10	6.14	5.39	2.94	3.50	24.07	2.10	0.53	35.94	11.87								
8. Lake . . . . .	8.52	6.40	5.57	4.00	4.10	28.59	5.57	0.73	46.82	18.23								
9. Lithuanian . . . . .	7.87	5.43	3.15	2.85	5.05	24.35	5.30	0.64	35.21	10.86								
10. Baltic . . . . .	10.18	8.83	5.47	3.78	5.15	33.41	8.50	0.77	61.07	27.66								
11. Northern . . . . .	7.32	11.35	7.65	3.60	3.00	32.92	6.10	0.76	48.19	15.27								
12. Vistula . . . . .	9.40	7.80	4.80	4.35	7.90	34.25	7.00	0.70	58.80	24.55								

Regions.	Ploughing, sowing and care of crop.		Cost of grain.		B u c k w h		R o u b l e s.		Total expenses.		Rent paid per season.		Average price per pond during 4 years, 1885 to 1888.		Amount of the harvest.		Profits.		
					Harvesting and transporting from field.	Threshing and clean- ing of the grain.													
1. South-western . . .	5·85	4·55	4·12	2·98	4·74		22·24	7·30	0·58	28·02	5·78								
2. Little Russia . . .	5·36	3·34	4·10	2·57	4·10		19·47	7·06	0·54	22·31	2·84								
3. Central agricultural.	4·40	4·78	2·80	1·98	4·04		18·00	8·90	0·70	27·73	9·73								
4. Central Volga . . .	3·88	4·40	2·12	1·74	2·70		14·84	7·40	0·62	20·61	5·77								
5. Nizhni-Volga . . .	3·37	3·50	2·15	2·30	3·05		14·37	3·30	0·50	23·05	8·68								
6. Trade . . . . .	6·80	7·68	3·60	2·88	4·22		25·18	5·00	0·76	29·96	4·78								
7. White Russia . . .	5·95	4·24	2·61	2·81	4·55		20·16	5·34	0·60	22·13	1·97								
8. Lake . . . . .	7·16	4·30	3·77	2·57	4·10		21·90	5·57	0·83	39·97	18·07								
9. Lithuanian. . . . .	7·35	3·51	2·63	2·30	5·05		20·84	5·30	0·60	23·24	2·40								

	M	i	l	l	e	t.
1. New Russia . . .	7·60	1·12	5 62	3·27	3·19	20·80
2. South-western . .	7·37	2·25	4·45	3·34	4·74	22·15
3. Little Russia . .	6·63	1·48	5·00	3·84	4·10	21·05
4. Central agricultural.	8·27	1·41	3·21	2·24	4·04	19·17
5. Central Volga . .	6·65	1·14	3·77	2·20	2·70	16·46
6. Nizhni-Volga . .	5·37	1·23	3·90	3.00	3·05	16·55
						3·30
						0·53
						27·18
						10·63

Regions.	Ploughing, sow- ing and care of crop.	Cost of grain.		Harvesting and transporting from the field.		Repairing, insuring of buildings, paying of farm debts, admin- istration expenses and land taxes.		Total expenses.		Rent paid per crop.	Average price per pound during 4 years, 1885 to 1888.	Amount of the harvest.	Profits.
		P	O	T	A	T	O	E	S.				
	R	O	U	B	L	E	S.						
1. New Russia . . . . .	16·11	14·51	13·02	3·19	46·83	5·34	0·37	88·33	41·50				
2. South-western . . . . .	14·07	19·82	16·00	4·74	54·63	7·30	0·16	87·50	22·87				
3. Little Russia . . . . .	13·30	10·38	10·04	4·10	37·82	7·06	0·15	75·20	37·38				
4. Central agricultural . . . . .	10·00	10·20	8·09	4·04	33·14	8·90	0·10	66·62	33·48				
5. Central Volga . . . . .	7·81	7·20	8·20	2·70	25·91	7·40	0·15	52·65	26·74				
6. Nizhni-Volga . . . . .	8·00	7·00	11·40	3·05	29·45	3·30	0·17	69·50	40·05				
7. Trade. . . . .	13·23	15·26	11·55	4·22	44·26	5·00	0·20	110·54	66·28				
8. White Russia. . . . .	12·00	14·85	13·00	4·55	44·40	5·34	0·16	102·30	57·90				
9. Ural. . . . .	7·25	7·60	8·10	3·50	26·45	2·10	0·23	74·50	48·05				
10. Lake . . . . .	12·70	16·68	9·77	4·10	39·15	5·57	0·20	111·54	72·39				
11. Lithuanian. . . . .	13·47	17·37	12·72	5·05	43·56	5·30	0·17	90·40	45·84				
12. Baltic . . . . .	16·00	24·83	19·00	5·15	64·98	8·50	0·19	169·75	104·77				
13. Vistula . . . . .	23·00	18·60	16·35	7·90	65·85	7·00	0·15	113·40	47·55				

In examining the preceding tables, besides the above observations it must be taken into consideration that the amount of the harvest of the separate cereals and the expenses of cultivating the same are represented in them as being higher than the reality in the above regions. This is explained by the fact that among the estate owners who sent their information to the Department those predominated whose farms were in the better condition, and therefore on the one hand their expenses, and on the other, their profits were the greater. Nevertheless the comparative profit of cultivating certain cereals in different regions will be on the average correct, as the gross receipts, as well as the expenses mentioned in the tables, must be lowered in the same proportion.

From these tables it may be seen that during the last five years the smallest profits, which in some localities did not even exceed the land rent, were produced from the principal Russian cereals, rye and oats, and nearly everywhere, especially in northern Russia, the cultivation of potatoes was most advantageous. In the south the greatest income was obtained by cultivating wheat, especially winter wheat, and to some extent barley. As a natural consequence there should be a considerable development of the cultivation of the latter cereals at the expense of rye and oats. But such a development is only possible in very small dimensions owing to the natural conditions of agriculture and also to the fact that a considerable increase in the cultivation of certain crops, and especially of such the sale of which is very limited, as for instance the potato, would lead to the fall of prices in consequence of which a further development in the cultivation of such a crop would be not only disadvantageous but very expensive. Therefore in the Chernoziom region, and especially in its southern part, where owing to the fertility of the soil a development in the cultivation of one or another cereal is not hindered by the necessity of augmenting the quantity of manure and consequently the number of cattle, the same cereals have been re-cultivated during the last ten years, as were produced formerly. Judging by the information which the Department of Agriculture receives yearly from its correspondents, an increased cultivation either of rye at the expense of wheat, or of wheat at the expense of rye, has been observed in the whole of the Chernoziom regions during the last ten years, owing to the changes in the demands and prices of these cereals.

The same fluctuations were observed in the cultivation of barley and oats and some oil plants. In the central agricultural region, in the beginning and the middle of the eighties, a great development in the cultivation of the potato was observed which was influenced by the increased demands for that vegetable by wine distilleries; later on the potato crop again decreased. In the non-Chernoziom governments, field culture can be advantageous only if the manure is abundant, and therefore, the quantity of ploughed lands, dependent upon the development of cattle raising, is for the most part very limited compared to the number of lands covered with pastures and woods. Here only the sowings of flax increased and decreased periodically, influenced by the changes in the demand for it. The development of ploughed lands could not be as rapid as in the Chernoziom regions, and the relation between areas sown with different cereals underwent no changes.

The profitability of some special cultures was defined in Chapters VIII and IX. As to data showing the profitability of cattle raising and its branches, as also of dairy farming, they were mentioned in Chapter X. It is still more difficult to calculate the average profits of all these branches of farming in the separate localities or regions than it was for field culture. Therefore without calculating the profits of each of these

branches taken separately it is better to examine the signification which they have for the rural economy of the different localities. In valuing the relative significance of these separate branches the great difference which exists in the farming of landowners and peasants must be taken into consideration. The farms of landowners are more extensive, the work is done by hired workmen and is impossible without a more or less considerable floating capital. In such farms all the products serve for sale and only a small part of them is consumed by the landowner himself. In peasant farming, however, the cultivations are of small dimensions, the work is done by the members of their own family, and only a very small part of the products are sold, the greater portion of them being consumed by the peasant and his family.

It is therefore natural that while estate owners try to cultivate principally such products as are easily sold and which pay back the expenses of their cultivation, on the peasant farms the greatest care is to cultivate such products as are the most necessary for family use. The peasant sells only the surplus of his crops after the needs of his family are supplied. Such a state of things is also influenced by the fact that in cultivating his own land, the peasant does not value his own labour, and the greater part of the money he receives is not from his own farm, but from the labour he does for others, in the field or the factory, as was explained in Chapter III. Rye bread forms the principal food of the peasant, and this fact explains why the relative number of ploughed lands on the peasant farms, is much greater than that on the estates, and that in the former, cereal culture occupies the first place even in those regions where on estates it is of secondary importance. Therefore, in those places where winter wheat is a profitable cereal the estates show a greater percentage of wheat fields than the peasant farms.

The easiest way of examining the relative significance of the different branches of farming, if only in their general traits, is by grouping the governments in the same order as in the above table. Some details concerning this question can be acquired from the preceding chapters, each of which treats of one of the principal branches of farming, either of some special crops, or of the areas occupied by different cereals. It is only necessary to emphasize the principal traits of each region, without going into details.

In the New Russian and southern steppe governments the raising of live stock, and especially of sheep, was formerly the principal industry, especially on landed estates. But with the construction of railways, the improved means of transportation, the increase of the population and of the number of workmen, the culture of cereals, especially that of wheat and of spring wheat, threw the raising of live stock into the second place, although it still remained an important industry. At the present time the welfare of that region, except southern Crimea as also the valleys on the north of the Tauride mountains and some localities in Bessarabia and on the Don, depends principally on the harvest and sale of wheat, and very little on that of cattle raising, or the sale of animal products, especially of wool.

In the south-western governments, which are very fertile and thickly populated, except the northern border of the Volyn government, the first place in farming is occupied by the cereals, and especially on landed estates by winter wheat. Furthermore, the growing of beet and the production of beet sugar is of great importance in the above governments, and particularly on such estates as possess sugar works. Cattle raising plays an insignificant part in these places.

In Little Russia, except the northern districts of the government of Chernigov where the soil is not Chernoziom, field culture and the growing of cereals occupy the first place on the estates, as well as on the peasant farms. But there is no principal cereal here, on the harvest of which could depend the favourable or unfavourable results of the year. The areas sown with rye, wheat, barley, oats, and partly with millet and buckwheat, are comparatively equal. The part which the raising of live stock plays here is rather small, although in the southern portions of that region there is a considerable number of sheep farms.

In the central agricultural region, and especially in some of its central localities, the proportion of ploughed lands is at the maximum. The raising of live stock, notwithstanding the progress that milk farming has made in some northern parts of the region, is very much restrained by the want of pasture lands and, therefore, is of small dimensions. The profits of the greatest number of farms are wholly dependent on field cultivation. Of the cereals cultivated here the principal are rye and oats, the growing of which visibly increases from south-west to north-east, and predominates over that of the other grain crops. Except the governments of Koursk and Voronezh, which serve as a transition to Little and New Russia, the profits of the farms and the welfare of the whole population depend upon the good or bad harvests of these two cereals, especially of rye.

Except the southern part of the government of Saratov, which bears a steppe character as it passes to New Russia, having extensive areas of spring wheat and where the breeding of sheep is considerably developed, the central Volga governments, according to their rural economy, are very much like the last mentioned central agricultural region. They differ only in that they have a smaller proportion of ploughed lands and are not so densely populated, and therefore cattle raising is not so limited.

The groups of governments, called Nizhni-Volga and south-Ural and occupying an extensive area from the north to the south, differ much in their separate parts as to their rural economy. The northern part of the government of Samara and the north-western corner of that of Ufa have a great resemblance to the preceding group. The southern half of Samara and of Ufa and the greater part of the Orenburg governments are more like the southern steppes. Here the cultivation of spring wheat and the breeding of cattle predominate. In some parts of that region spring wheat occupies 80 and even 90 per cent of the total area, under cereals. In the greater part of the Astrakhan government agriculture plays an insignificant role or else does not exist there, as for example in the Kirghiz and Calmuck farms the principal farming industries being cattle raising, and on the Volga, fishing. Furthermore, in some localities situated in the valleys of southern Ural, farming in general occupies the second place, yielding the first to the mining industry.

In the Moscow manufacturing governments, as the name itself implies, the principal sources for the maintenance of the population are derived from manufacturing industries. Nevertheless on peasant farms the principal profit is gained by field work, and especially in the cultivation of flax for the fibre. The productiveness of landed estates depends in the same degree on field culture, dairies and forestry, and on separate estates one or the other of these industries often predominates. In some localities, as for instance in the neighbourhood of large centres, and in some parts of the Tver and Yaroslav governments, milk farming has made such great progress that the profits

gained from the sale of milk and its products are of great importance even on the peasant farms.

In the Belorussk governments, cereal culture is developed principally for the home use of the peasants and their families. On landowner estates, forestry is the principal industry, although there are numerous exceptions to this rule; peasants also gain much by the same industry. In the far west of the non-Chernoziom part of European Russia, in the Vistula, Lithuanian and Baltic governments, the characteristic trait of the rural economy of landowners, as well as of peasants, is the greatest conformity in the development of the separate branches of farming. Agriculture, cattle breeding, forestry and other smaller industries, tend alike to the productiveness of separate estates and not one of them in most instances predominates to such an extent as to deprive the others of their importance as estate products. This circumstance gives the farms of the mentioned regions a great solidity owing to which the productiveness of such farms, dependent on the small yearly fluctuations of the harvests, is nearly constant.

The lake governments form a transition from the above mentioned regions to the far north of Russia. The rural economy in the governments of St. Petersburg and Pskov, as also of the western part of Novgorod, is very much like that of the Baltic, Belorussk and the trade governments. The great importance that flax growing has acquired in the government of Pskov was mentioned in Chapter VIII. In general, agriculture and cattle raising as well as milk and dairy farming, form the principal profitable industries. In some estates forestry occupies the first place, and the money earned from the forest is everywhere in that region one of the principal sources of gaining a livelihood for the peasant. In the Olonetsk and the north-eastern parts of the Novgorod governments, forestry and its products make agriculture occupy the second place, the latter even exists only in very small proportions, and is exclusively practised by the peasants for their home wants.

From the region, formed by the northern governments, must be excluded the south-western corner of the government of Vologda, where agriculture and milk farming are developed to such a degree that it exports cereals, butter and cheese. Further north there are no landed estates, and even with the peasants agriculture is decreasing more and more. Here forestry, hunting and fishing form little by little the principal sources for the existence of the population, and nearer to the Frozen Ocean agriculture becomes quite impossible.

Of the two Ural governments there are no estates in Viatka, and in Perm there are only very extensive ones, in which mining and forestry for fuel predominate. The peasants live almost exclusively by agriculture, except those who belong to the metallurgical works and earn their living therein. In the peasant farms of this region, especially in the southern part of it, the first place is occupied by agriculture, and cattle raising is, as in the Chernoziom region, on the secondary plane.

From the preceding it is easy to draw the conclusion that nearly over all the Chernoziom region farming, on the estates of landowners as well as on peasant farms, consists principally, if not exclusively, in the cultivation of cereals. Therefore, the good or bad crops have a decisive significance for the economical results of the year, on the landowners estates as well as on peasant farms. It has been mentioned above, that the cereal harvests in Russia fluctuate greatly from year to year, and that in general, these fluctuations increase in the direction from the north-west to the south-

east. In the same direction increase the fluctuations of prices paid to workmen, attaining their maximum in the far south of Russia; besides, these prices are much more considerable in the Chernoziom than in the non-Chernoziom regions of European Russia. This is explained by the fact that in the Chernoziom region the population has no other earnings than from agricultural works, and the latter, owing to the predominating cultivation of cereals, are dependent upon the harvest. The fluctuations of daily wages are most considerable during harvest time, as may be seen in one of the above tables; this fact confirms what is said above. These conditions have a very important significance for Russian farming. Their influence in relation to landowners estates, which are founded on hired labour, and to peasant farms is, of course, not uniform.

By examining the rural economy of estates in the Chernoziom region, and especially in the southern parts of Russia, it will be seen to what great changes the gross receipts, given by the estates, and the amount of the expenses on them, are subject. The gross receipts depend principally on the prices of bread; and the amount of the expenses, on the wages paid to workmen. As the prices of grain mostly rise when the crops are bad, and the wages paid to workmen on the contrary decline, these two factors moderate the variations of the net income; nevertheless, they are so considerable, that in the worst cases, as for instance, when the crops are very poor, and the prices of cereals very low and workmen wages very high during harvest, field culture can be very unprofitable to landowners. For example, if the cost of the cultivation of spring wheat be the same as above mentioned, and the local price of this cereal fluctuate from 50 kopecks to 1·50 roubles per poud, the lowest price existing, when the crop is twice as good as the average harvest, as was the case during the last ten years as mentioned in Chapter VI, if it be admitted that sometimes the crops decrease to 20 per cent below the average, and the wages to workmen in good years become fourfold, as may be seen in the table concerning pay to workmen, if furthermore, it be taken into consideration, that the cost of cultivating the land and all other expenses, except harvesting, thrashing and cleaning of the grain, dependent on the crops, increase or decrease from 10 to 20 per cent, the calculations of the profit and loss which the culture of spring wheat gives, the principal cereal of the New Russian government, would be as follows.

	Harvest per dessiatine in pounds.	Price of wheat per poud.	Gross receipts per dessiatine.	Harvesting and thrashing.	All other expenses of cultivation.	Total expense per dessiatine.	Net profit + Loss —
	R o u b l e s.						
During a year of excellent harvest .	120	0·50	60	50·56	19·95	70·51	— 10·51
"    "    "    good harvest . . .	80	0·70	56	25·28	17·35	42·63	+ 13·37
"    "    "    average harvest . . .	58	0·85	49	12·64	16·75	29·39	+ 19·61
"    "    "    unsatisfactory . . .	30	1·10	33	10·44	16·75	27·19	+ 5·81
"    "    "    bad harvest . . .	10	1·50	15	6·32	13·25	19·57	— 4·87

From the above calculation it is seen that for landowners the most advantageous years are those in which the harvest is the nearest to the average, or a little better.

As to years of very bad, or of excellent crops, the former, of course, are always unprofitable, and the latter, when cereal prices are low and the pay to workmen very high, may sometimes prove for the landowners still more unprofitable than the former. Of course these calculations are more applicable to the southern governments, as nearer to the north they change for the better, as there the harvests as well as the wages paid to workmen, are subject to less fluctuation. The possibility of field culture becoming unprofitable, not only when the crops are very bad, as for instance in 1891, but also when they are very good, is confirmed by many data given by the Department of Agriculture. Thus in 1887 and 1888, when the crops were very abundant, the prices of grain very low, and the wages paid to workmen very high, in some parts of the southern steppe governments on some landowners estates part of the cereals were not harvested at all, as the expense would have cost more than the crops were worth. It must be understood, however, that when the crops are bad in other localities and the universal market is in a good condition, the prices of grain in separate regions can be very high, even when the crops are very good; in the same way the wages paid to workmen can be comparatively low, notwithstanding good crops in the southern governments, if the number of workmen, come from other localities, is considerable. In such cases the profits of the southern landowners can be very great. From all that has been said the conclusion may be drawn that the incomes of landowners in the Chernoziom region, and especially in the southern and south-western parts of it, are very irregular, and that the profits gained from the estates there sometimes exceed the average profit; very often, however, these estates bring no profit, but very considerable loss to the owner.

As it is impossible to foretell the amount of the expenses during harvest time, and the possibility of great losses instead of profits, the landowners must always have a considerable floating capital at their disposal without which they may be forced to contract debts. Thus in New Russian governments, where landowners run great risks in agriculture, the estates are burdened with mortgages. Besides, owing to the necessity of incurring great expenses during the harvest of cereals, the amount of which cannot be defined beforehand, the landowners very often sell their cereals uncut, and receive therefor a certain amount of advance money.

In years of good crops the peasants of the Chernoziom region cannot only supply their own wants with the cereals harvested on their lands, but even are able to sell a surplus; furthermore, in such years they earn much by working on estates, owing to the great demands for workmen and the increase of wages. When the crops are poor, the peasants have on the contrary to buy bread necessary for their own use, and that at a very dear price. As bad crops generally result from drought, they are often followed by great want of fodder, and therefore even the wealthiest farmers are often compelled to sell their stock in great numbers, and very cheap, the prices for them being always very low in such years. The information gathered during eight years by the Department of Agriculture and Rural Economy shows that the prices of cattle and horses are always higher in spring than in autumn. This is explained by the fact that as the keeping of cattle is much more expensive in winter than in summer, and as it is necessary to calculate the number of animals which remain for winter, as also the quantity of food provided for them, there is much more live stock offered for sale in the autumn than in the spring. Besides, information shows that the difference between the

autumn and spring prices increases in years of bad crops; and in the regions which have suffered the most, the autumn prices form sometimes only 25 to 30 per cent of the spring prices. In the Chernoziom regions these fluctuations are greater than in the non-Chernoziom. Sometimes, when the crops were very good, especially if a bad harvest had preceded, the opposite effect was observed, namely, a rise in the prices of stock in autumn, as compared to those in spring. This occurs because the peasants, who owing to good crops, have made good earnings and therefore have extra money as well as considerable quantity of winter fodder, always try to increase the number of their live stock, especially if they had been decreased the year before. These different prices of stock show, on the one side, that cattle serve very often as a reserve capital for the peasant, and on the other that, especially in the Chernoziom region, the number of live stock on peasant farms does not always correspond to the wants of peasants. This is influenced by the perpetual want of winter fodder, as the peasant ploughs land at the expense of meadows and pastures, and by the frequent necessity of selling cattle for supplying other wants.

From what has been said above it may be concluded that the rural economy of Russia is principally characterized by the irregularity of the profits given by farming, influenced by great fluctuations of the harvests, of prices of bread and of wages. As a principal means for regulating agriculture in the most fertile part of Russia, known under the name of the Chernoziom region, must be acknowledged the improvement of its technic, the development of non-agricultural industries and the closer relation between the separate branches of farming. This must result in the increasing and improving of cattle raising, in the development of milk farming, and in the spreading of special crops and agricultural industries. A tendency in this direction is being more and more observed, especially on landed estates, on which farming has made great progress during the last twenty years.

## CHAPTER XII.

**Farming machines and implements.**

THE differences in soil and climate of the rural districts have a great influence on the forms of farming implements in the different localities, as well as on the methods of cultivating the soil, and of growing and harvesting cereals and other crops. As stony soil predominates, and as it is necessary in many localities to plough lands cleared of forest, special types of implements have been invented in Russia, namely, the *sokha* and *boron a-smyk*. The former implement is a sort of wooden plough, with two ploughshares and a mouldboard, but with no plough point. The shares, fixed to a wooden beam, attached to two wooden shafts, are of very different forms, according to the qualities of the soil to be ploughed; sometimes they are very narrow, have the form of a chisel, and are used for very strong and compact earth; sometimes they are wide, triangular in form, and are used for soil that is soft and free from stone. This form of plough is until now very much used in the northern and central non-Chernoziom governments. The replacing of such ploughs by others of more improved construction, is retarded by the necessity of having to plough fields, formerly under forests, and to dig out stumps and rocks from the soil. But at the present time these implements are being little by little replaced by small one-horse ploughs, with steel mouldboards and shares.

The Russian harrow, called *boron a-smyk*, has a dangerous rival in the spring harrow imported from the United States. But unfortunately, owing to their high prices, 50 to 70 roubles per piece, these implements are not much used on Russian farms. The ploughs above described are not the only ones used in Russia; they are of very various makes in different localities. As the Russian ploughs are rather frail implements, it was found necessary to improve and strengthen them; thus, in the government of Tambov for making the mouldboard, two such pieces of wood were used as could form a sort of a bridge or support, and thus make the plough more stable. The Russian ploughs are mostly swivel or side-hill ploughs. Such a construction is not accidental, but arises from the circumstance that small farmers, having tillable lands of small dimensions, were compelled to construct such implements as would plough up and back in the same furrow. The *sokha* costs 3 to 5 roubles each.

Besides the above mentioned *sokha*, very much used in Russia, there is one of another type used in the western governments and called the *litovsk sokha*, or Lithuanian plough. It has a stationary mouldboard made of two parts, and cannot be thrown from one side to the other. This *sokha* is drawn by a yoke of oxen or of cows.

There is no one-horse Lithuanian plough; this type of sokha is not a swivel or side-hill plough, but a one-sided implement.

The Russian sokha being gradually improved becomes more and more like the ordinary plough. Such improved implements are the kossulia or samolet, much used in the governments of Yaroslav and Vladimir, and saban, general in the north-east of Russia, especially in the governments of Perm and Viatka. These ploughs do not have two shares, there being but one triangular share, a wooden or iron mouldboard, of a more regular form, and an iron plough point. The kossulia has no ploughshoe; the horse is hitched in shafts, as in the sokha. The kossulia is exclusively a one-horse plough, and the saban may have two horses. Both of these implements are more like the West-European plough, are better made than the sokha, and are able to plough deeper. The price of the kossulia, as well as of the saban, fluctuates from 5 to 7 roubles.

The necessity of ploughing compact and turf soil, as also fresh lands in the southern steppe and Chernoziom governments, has influenced the construction of very strong ploughs, such as are able to upturn the above mentioned earths very deep. Therefore in that region a plough has been invented, very much like those of the present time. It is called the Little Russian or colonist saban, and has all the parts of an ordinary plough, such as handles, shoe, landside, mouldboard, share, point and beam. The straight mouldboard, tightly set, and generally of wood, and the share of a very rough construction, are very effective in such forms of ploughing. Such an implement is of great strength, owing to which 5 to 6 pairs of oxen are hitched to it for breaking new land, 3 to 4 vershoks deep. Such ploughs cost from 7 to 10 roubles each. The German colonists, who immigrated to Russia at the end of the eighteenth century, have gradually improved this plough by making the mouldboard, landside and the shoe of iron instead of wood, and by giving the share a more regular form. The chief peculiarity of this plough is that its landside is curved, owing to which it makes a broad furrow and keeps the grass from clogging it. As this implement is so general in Russia, the two celebrated English firms, Ransom, Sims & Jefferis, and Howard Brothers, constructed in 1875 a plough very similar to that of the colonists. Similar implements were also made in German factories, for example, by Ekkert, Fleter, Lenig and others. At the present time this perfected instrument has supplanted, on nearly all the estates, the Little Russian and the colonist ploughs.

In the Caucasus and Transcaucasia the ploughs are of very different construction, from the most simple, without a mouldboard like the primitive types, to the large Georgian plough drawn by 8 to 12 pairs of oxen, and with a wooden mouldboard; it is something like the Little Russian plough. Besides the harrow, called boronasmayk, and which costs 30 to 50 kopecks, the central and southern governments use other forms, with wooden or iron teeth. They consist of a square frame to one corner of which the horse or ox is hitched.

In the southern steppe governments, owing to extensive arable lands and to the lack of workmen, a new method of ploughing has been introduced. It consists in joining three or four ploughs together, instead of using one simple implement; such a plough is called a boukker. With these compound ploughs the soil is upturned, immediately sown, and the seed covered with the aid of a drag called a ral; the latter consists of a massive wooden beam, to which 5 to 8 iron or wooden teeth are fixed. Sometimes a more simple process is followed: first the seed is sown and then covered with the boukker or the ral.

The sowing of the fields until now is mostly by hand, and the seed is generally covered with simple harrows. The cutting of grass and the reaping of grain is generally with scythes and cradles, principally imported from Austria. In the Tauride and Ekaterinoslav governments, owing to the influence of the German colonists, reaping machines, made in the mechanical works belonging to the colonists themselves, were introduced in the sixties. These machines, called *lobogreika* or *choubogreika*, are constructed according to the ancient American type, made by Walter Wood, one of which was brought to Odessa in the fifties. Their construction has been gradually improved and now about 10,000 of them are made yearly.

The thrashing of grain is by different methods, on many estates by thrashing machines of the English system, which were first constructed in Moscow by Wilson. These were the first machines of improved type introduced into Russia. Until now, in the different localities of the Empire, thrashing is done with the aid of horses, rollers, carts and other means. For these methods of thrashing, the sheaves are laid in a certain order and then from 3 to 6 horses are made to run over them, or carts, or wooden rollers, as in the governments of Yaroslav, Vladimir and Vologda, or rollers of iron, as in the steppe governments, are drawn over them.

The grain is winnowed with the aid of a fanning mill, or simply with the spade and wind process, and is finally cleaned on a peculiar leatheren sieve or with cylindrical sorters, with a system of wire screens. In the southern governments the colonist winnowing machines are very much used. They are of a special construction and the sieves in them move backwards and forwards, and therefore clean the grain very rapidly. The above mentioned implements and machines are until now used by peasants, German colonists and Cossacks, partly also by the estate owners.

The Russian farming industry could not be satisfied with these primitive implements and therefore gradually improved machinery is introduced. The necessity of such improvements began to be felt at the end of last century; thus, in 1774 the Imperial Economic Society offered a premium of 35 chervonets (a gold coin worth three roubles) for the best reaping machine. But the necessity of improved instruments was especially felt at the beginning of the present century, since when competitive trials have been made with reference to the various types of improved farming tools and machines.

Already in 1802 an Englishman, Christopher Wilson, established in Moscow a factory for the manufacturing of thrashing machines; later on, in other parts of Russia, similar works were organized. In 1818 was opened in Warsaw the manufactory of Lilpop, in 1815 in Simbirsk, that of Andreev, and in 1830 in Moscow, that of Bouzenop. The above mentioned works laid the foundation for the building of farming machinery in Russia, which has gradually developed ever since. At first these works produced principally thrashing machines, fanning mills and their accessories. But as the demand for farming implements and machines was very small during the beginning of this century, the manufacture grew but slowly. Until 1862 there were only 60 agricultural works in Russia. This small number is explained, of course, by the fact that, owing to the existence of serf labour, there was no great need for machinery. Since the great reform of February 19, 1861, the demands for agricultural machinery have grown greatly and have increased their development and manufacture in the Empire. At the same time a fundamental change has taken place in Russian farming, as well as a tendency to increase the number of farming implements. From 1859 to 1863 a remarkable

increase in the demands for such appliances was observed, as the estate owners of that time, being deprived of peasant labour, were obliged to have recourse to improved machines. The following figures give an idea of that increase: thus, in 1849 the import of farming implements was valued at 6,552,934 roubles, and in 1859 it amounted to 11,296,612 roubles.

The considerable import of machines, in the beginning of the sixties, was soon followed by a careful and practical view of this economic question, the more so as the demands for agricultural machines became more general. The attention of the Government was drawn to the necessities of the Russian farming industry and it took measures to develop the building of farming implements and machines in Russia by aiding certain mechanical works, by giving subsidies, and allowing such factories to receive iron and pig iron duty free; it concurred in the organization of depots, founded in 1865 the Imperial Farming Museum in St. Petersburg, imported and spread new samples, freed the foreign machines from duty, arranged exhibitions and all sorts of special competitions to encourage and further the industry. The free access of foreign machines not only brought them within easy reach of the farmers and estate owners but also influenced the organization of a considerable number of depots in the different localities of Russia. Owing to such measures the landowners were able to see and examine the different makes of machines and to secure the same without bringing them from abroad. The number of such depots in 1892 amounted to 200.

As the foreign machines were admitted free into Russia the landowners bought largely, and generally the better types, so that the Russian manufacturers became acquainted with new models of perfect execution, and by imitating them, soon improved their own makes. The demands for foreign machines increased gradually, and the import grew accordingly. The following figures show the average import, in four-year periods, beginning fromm 1869:

In 1869—1872 Imported 259,439 Pouds.		
» 1873—1876	»	566,306
» 1877—1880	»	629,551
» 1881—1884	»	962,274
» 1885—1888	»	422,305
» 1889	»	594,533
» 1890	»	473,781
» 1891	»	429,000

The above figures show that from 1869 to 1885 the import steadily increased; in 1869 it was 117,750 and in 1884 it amounted to 1,026,800 pouds. This increase was due partly to the reorganization of farms, since 1861, by considerable improvements in the different branches of farming, by the fact that the peasants leased private and Government farms, by the cultivation of new lands in southern, eastern and south-eastern Russia, by the lack of workmen, and by like other considerations. In a word, this increased import is the result of the remarkable development of the farming industry in Russia until the year 1885, when the cereal harvest grew from 10,335,556 in 1869, to 36,774,840 chetverts in 1884. In 1885 the import of agricultural machinery fell to 489,912 pouds and decreased gradually in 1886 and 1887. Although in 1888 and 1889 it rose to 589,000 and 594,000 pouds, 1890 and 1891 it fell again, scarcely amounting to 429,000

in 1891. Such variations in the import were due on the one hand to the fluctuations of the cereal harvests during the last 6 or 7 years, and on the other hand, to the decrease in the import, coincident with the laying of a duty upon farming implements, in 1885, of 50 kopecks, and in 1887, of 70 kopecks per poud. The principal reasons why the demand on foreign machines became feeble were, the development of machine building in Russia, and the gradual impoverishment of the landowners, owing to the fall of prices of farm produce, which reached its lowest point in 1890. Until 1885 the principal purchasers of foreign machines were landowners, but since then the peasants, Cossacks and lessors of private and Crown lands have imported many such implements. They began to buy not only the cheaper and simpler makes, but also the more complicated types, such as reaping, mowing and thrashing machines, and in some instances the peasants have bought steam thrashing machines for cash.

The principal centres of trade in farming implements and machines are Rostov-on-Don, Odessa, Kharkov, Kiev, Moscow, Warsaw, Riga, Saratov, Samara and St. Petersburg; Rostov-on-Don occupies the first place, as it is now one of the principal points in south Russia which supplies the two richest regions of Kouban and Tersk and the government of Stavropol with farming machines. There are 6 large and 5 small depots in that town. The greatest number of portable engines and steam thrashers, of which, in 1888, 400 were imported valued at 2,500,000 roubles, are taken by the south. The first depots for farming machines were established in St. Petersburg, Moscow, Warsaw, Kharkov and Odessa.

Agriculture implements and machines are principally imported from England, Germany, the United States of America, Austria, and some from France. In the sixties the principal exporter was England. Russia imported ploughs, thrashing and winnowing machines, portable engines, root and straw cutters, chiefly of English construction. At the present time the English ploughs are supplanted by German makes, and England sends to Russia only steam thrashing and sorting machines, portable engines, and other machinery to a limited extent. From Germany principally ploughs, simple as well as compound, drills, planters, horse and hand thrashing machines, fanning mills, weeders, straw and root-cutters are imported. The principal German firms are R. Sack and G. F. Ekkert. Notwithstanding the high quality of the English ploughs, they have been supplanted by German types, only because the latter are the cheaper. Formerly the English makes were exclusively brought into Russia.

The United States of America made Russia acquainted with their machines and began to export them into the Empire only since 1876, when, owing to the Centennial Exposition at Philadelphia some Russian specialists were able closely to examine the excellent qualities of the American machinery. Until that year the Americans, principally Wood, Mac Cormick, Osborn and others, sent into Russia only reaping machines, and had to compete with the English makes. But since 1876, drills and planters, spring harrows, mowing machines, binders, horse rakes, and hay presses have been imported from America, and in this line the latter has no rival in Russia. American reapers, mowing machines and horse rakes have quite supplanted the English types; American drills have taught the Russian farmers to sow in rows, and the American hay presses are regarded as models; but ploughs of American construction are not used in Russia, only because they are too expensive; as to their quality, they occupy the first place.

Austria exports into Russia only horse thrashers and a few winnowing and sorting

machines. Notwithstanding their good quality Austrian machines cannot compete with the German, owing to the high prices of the former. The latter gradually supplant them on the Russian markets and probably Austrian machines will soon go entirely out of use in the Empire. The same may be said of the French farming machines, which notwithstanding the development of machinery building in the French Republic, are very little sent into Russia. Until now only weeders, from Mareau, Cabasson and Claire are brought into the Empire, and the other machines are not imported at all, owing to their high prices and to their construction being ill adapted to the requirements of the Russian farms.

With the increased demands for farming implements and machines, as well as with the development of the import, local machine shops became necessary for repairing foreign implements, and for making new ones according to the foreign models. Therefore, the development of the home machine works corresponded to that of the import. As there are no data showing the quantity of implements and machines constructed in Russia between 1862 and 1892, it is difficult to represent the gradual development of the industry. However, if the number of mechanical factories and workshops, given by the Almanac and the "Record Book of the Russian Farmer", edited by F. A. Bataline, be taken as a guide, a progressive development will be remarked. In 1864 there were only 64 mechanical establishments, and in 1871 there were 112; later on, their number increased; thus, in 1871 there were 203; in 1879, 340; in 1885, 435; and in 1892, 400. These data show that the building of farming machines developed as much as the different unfavourable conditions would permit. There is no doubt that, had these different obstacles been removed in time, the building of Russian agricultural machinery would have grown still more. From the very beginning their manufacture met with all sorts of hindrances, such as the lack of exports, and of experienced workmen; the high prices of materials, such as steel, iron, pig iron and wood, not to mention the fact that these materials were often of very bad quality; the absence of cheap credit; the expense of the transport by rail; the dependence of machine building on the crop; the impossibility of exporting the machines; the great competition with foreign makes, and other like causes. But notwithstanding these unfavourable conditions the Russian agricultural machine industry has conquered all difficulties and at the present time is in a satisfactory position. According to existing data the yearly production of Russian farming machines and implements may be valued at ten million roubles.

The number of depots for the sale of agricultural machinery, brought from abroad, is dependent on the greater or smaller demands in the different localities; that dependence is still greater for the mechanical factories and workshops. At the present time the greatest number of such establishments is organized in the following regions: in the three Baltic governments, in the Vistula, in the central, in the governments of Ekaterinoslav, Kherson and Tauride, and in the Kharkov government. The central points of these regions are Riga, Warsaw, Moscow, Kharkov and, to some extent, Odessa. In the first two regions the machine industry was introduced much earlier than in the others, owing to the advanced state of agriculture in these places, demanding, therefore, improved implements. In central Russia the industry was developed, owing to the favourable geographical conditions of that part of the Empire, as also to the improved state of farming. In the southern governments this development was influenced by the lack of workmen for the cultivation of new land on very extensive farms.

In examining the separate categories of the machine industry in Russia the production of ploughs must be put in the first place, and considered as the triumph of the industry. The progress made in the manufacture and construction of this instrument is very considerable during the last ten years. The first plough of improved type made its appearance at the Moscow Exhibition in 1882, but since then their number has greatly increased. Workshops producing especially constructed ploughs were formerly very rare, but now there are numbers of them, the leading firms being John Hoene, Jacob Hoene, F. Shelle in Odessa, Donski Brothers in Nikolaev, the Votkinsk Crown Manufactory, the Riazan Co., and Ganshin and Co. in Yaroslav. The demands for ploughs increase yearly and have developed to such an extent that, for instance, in Rostov-on-Don, the trade in them can be compared to that of articles of first necessity. In an ordinary year about 10,000 ploughs are sold, and when the crops are very good, many more; the same holds good in Moscow.

The Votkinsk Crown Manufactory, notwithstanding the short existence of its manufactures has made and sold during five years 9,000 compound, and 7,000 simple ploughs, to the value of 400,000 roubles. In like manner other mechanical works have increased the production of ploughs, as for instance, the machine factory of Emil Liphardt and Co. in Moscow, which made in 1885, 1,700 ploughs, and in 1892, 6,942. The greatest number is bought by the peasants. As until the present a great many primitive implements are used in Russia, which must be replaced by improved types, the growth in the manufacture of better makes is secured in Russia. The regions on the Volga require at the present time only 20 to 25 per cent of foreign ploughs, and the remaining 75 to 80 per cent of the total are furnished by the home production; five years ago the reverse was true.

The production of drills in Russia is also much developed. Those which scatter the seed are mostly made at home, and are imported in very small numbers. Such drills as drop the seed in rows are also being made in Russia at two factories, Gelferich-Sade and the Elvorti Brothers, both of which imitate the drills of American type. There is no doubt that in time the Russian farmer will have to abandon the scattering seed-sower and will employ exclusively the row-drill; therefore the demands for drills will increase and secure the production of such makes in Russia.

The manufacture of reaping machines called lobogreika and choubogreika, is especially developed in Russia. They are made at the mechanical works belonging to colonists, in the governments of Ekaterinoslav, Tauride and Kherson, and also in the factories in Kharkov, Elisavetgrad, Berdiansk, Marioupol and in other towns. Seven or eight years ago this industry was not much developed, but latterly it has attained great proportions. In summer, 7,000 to 8,000 pieces are sold yearly, and when the crops are good, considerably more, so that the manufacture of reapers in southern Russia may be considered as second only to that of ploughs. Trials have been made of producing such reapers as throw off the grain in bundles; the prices of such machines are remarkably low.

As to mowing machines their manufacture is not much developed, owing to the circumstance that mowing by hand is so cheap that the machine cannot compete with it. Thrashing and winnowing machines have always been a principal production of Russian agriculture factories, as since the beginning of the present century Russian farmers found it necessary to supplant all forms of hand thrashing, such as with the

flail, horses, rollers, carts et cetera, by thrashing machines. The first factory to make thrashing machines was established by C. Wilson in 1802 and 1803. The production of the latter became so popular that during the last 30 years peasants began to build them and organized a working centre in the town of Sapozhok, government of Riazan and its environs. These peasants produced in the beginning of the eighties, from 2,500 to 3,000 thrashing machines yearly, and the industry was so profitable that tailors, bakers, innkeepers and others in the town of Sapozhok began to construct these machines. The competition became so great that a thrashing machine for 4 horses was sold from 120 to 140 roubles each, its transport to the railway station included in that price. In general the construction of simple thrashing machines in Russia has been so successful that there is no more need to import them. Horse thrashing machines are only imported in small numbers for the most fastidious purchasers.

In the production of complicated thrashing machines, and especially in those working by steam, Russia is still far in the rear of other nations. Until now they are being imported, which is explained by the fact that the Russian builders cannot get dry wood of good quality, and have not enough money to carry a stock of seasoned lumber. They are therefore obliged to use improperly seasoned birch, pine and fir, instead of dry ash, beech and oak wood. Moreover, as the demands for steam thrashers are dependent on good crops, the builders of these machines run great risks. Although the manufacture of fauning mills is much developed in Russia, nevertheless a great number of them are imported. They are principally made in villages by common workmen and therefore cannot satisfy more exacting purchasers. Nevertheless such home-made machines are of very great importance for peasant farms in the governments of Viatka and Perm, where they are produced in great numbers, and cost from 10 to 20 roubles.

Little can be said of the other machines. Horserakes are not made in Russia, owing to the fact that steel wire is too dear, the Russian workmen not knowing how to harden steel, and to the absence of suitable wooden material. Portable engines are produced by two or three factories and that in small quantities, as their manufacture requires a serious and complicated footing, experienced foremen, and especially a considerable floating capital, in as much as the sale of such machines is in no way secured. In a year of bad crops they do not sell, and must wait for purchasers till the next year. Nevertheless the production of portable engines in Russia has been on the whole very successful, and if the difference in the prices of the English, which cost 7 roubles per poud, and the Russian costing 9·25 roubles per poud, could be lessened, the latter would compete successfully with the foreign goods.

The manufacture of scythes was introduced into Russia not long ago. At the present time there is an extensive factory belonging to Possel at Vileika, station of St. Petersburg, Warsaw and Libau-Romny Railroad, where scythes are made in large quantities, and in their quality exceed the Austrian types. But unfortunately the necessity of importing steel from Sweden makes it difficult to manufacture Russian scythes at a price sufficiently cheap to compete with foreign makes.

## CHAPTER XIII.

**Agricultural Schools.**

Historical sketch; contemporary schools; high and middle agricultural schools with farms; geodesic schools; garden schools; the Imperial Botanical Garden in St. Petersburg; the Imperial Nikitsk Garden in the Crimea; lower agricultural schools; the dissemination of the Science of Agriculture, independent of the special schools; Museum of Agriculture; Experimental stations and farms.

## HISTORICAL SKETCH.

UNTIL the end of the eighteenth century no measures were taken to develop the science of agriculture in Russia. Only at the end of the last century during the reign of Emperor Paul, the first practical school of agriculture was founded, near Pavlovsk, government of St. Petersburg. Persons of both sexes and of all classes were admitted; the full course was three years. But it was soon learned that the requirements of that school could not be realized, and in consequence its doors were closed in 1803.

After this unsuccessful attempt to disseminate the science of farming the two agricultural organizations, the Moscow Society of Agriculture and the Economic Society of St. Petersburg, took the lead in this matter. The first opened in 1822 in Moscow an agricultural school with an adjoining farm where at first only peasants belonging to landowners were admitted. Later on, however, in 1835, boys of other classes had also free access to the school. The qualifications of entry were that all applicants should be able to read and write and should be not less than sixteen years of age. The full course was 5 years and consisted of the ordinary sciences, as also geodesy, chemistry, physics, mechanics, agriculture, architecture and book-keeping. The aim of the school was to qualify young men to manage estates.

A similar school was founded in St. Petersburg in 1825 by Countess Strogonov who gave it over to the Imperial Economic Society and permitted the students to make their practical studies on her estate in the government of Novgorod, 70 versts from St. Petersburg, and containing 530 dessiatines. Later on, this school was upheld by the Government; nevertheless, as it proved to be too much of a financial burden for the Countess, and as it did not show very practical results, it was closed in 1844. The same fate awaited the two agricultural schools founded near St. Petersburg in the forties: that of Udelnoe exclusively for peasant boys, and the St. Petersburg School, belonging to the

Economic Society, exclusively for boys of the nobility. The peasant students soon left the school and returned to their old ways of farming, while the students of the nobility, profiting by the rights given them by the school of getting the first grade, entered the Government service.

The Committee for improving Agriculture in Russia which, thanks to the President of the Imperial Economic Society, Admiral Mordvinov, was founded in 1833, had the greatest influence on the development of the science of agriculture in Russia. Due to that Committee the Government supported largely the Economic and Moscow societies in the organization of schools. In 1836 it was decided to establish a new school in the town of Gorki, government of Mogilev, and Mr. Schmalz, a professor of Rural Economy and Technology in the University of Yuriev was permitted to open, with the aid of the Government, practical agricultural classes, near Yuriev for preparing teachers for the proposed school in Gorki.

As to the other branches of rural economy measures have only been taken for disseminating the science of gardening. To that end the Nikitsk Garden was founded on the southern border of the Crimea in 1812, owing to the pains taken by the former Governor-General, Duke de Richelieu. The principal aim of that institution was the cultivation and acclimatization in the Crimea of the plants of southern countries. In 1828 the Magarachsk School of Viticulture was joined to the Garden. Moreover during the reign of Emperor Alexander I, two garden schools were opened, one in Penza and one in Ekaterinoslav, and the Imperial Botanical garden in St. Petersburg. The Ekaterinoslav school was closed in 1859, and that of Penza and the Botanical garden in St. Petersburg have been in existence ever since.

Systematic measures for the spreading of the agricultural sciences in Russia were taken by the Government only since the reign of Nicholas I, when the Ministry of Crown Domains and Agriculture was established. Thereafter, an agricultural school with an extensive special course, but with very limited instruction in other branches, was opened in the town of Gorki, in 1840. It was divided into two sections, a lower and a higher and tended to the dissemination of the science of agriculture. The lower section was designed principally for peasants. In 1848 this school was transformed into two separate branches: a higher, called Gorigoretski Agricultural Institution for furnishing educated agriculturists, and a middle school for preparing land stewards and farm bailiffs. About 40,000 roubles were yearly appropriated for the maintenance of the institution together with the school and farm. To the institution such young men were admitted as had finished their literary studies in a middle school. The course there was four years during which the students were trained in natural and agricultural sciences and were given practical lessons in farming. Those who finished the full course in that Institution had the same rights as those who were graduated from the universities. In 1864 this Institution was transferred to St. Petersburg, and in 1869 the teaching of forestry received so much attention that the Institution was divided into two sections, that of Agriculture and that of Forestry. In 1878 the first section was closed altogether, when the school was transformed into a higher school of Forestry.

From the foundation of the Gorigoretsk Agricultural Institution to the year 1865, when it was transferred to St. Petersburg, 499 persons had completed the full course, and if the 70 students who finished the higher section be included, the total would be 569. The greater number of these students having studied not only theoretically but

also practically, because of the farm connected with the institution and also to their frequent trips with their professors to the neighbouring estates, have fully given themselves up to the farming industry and are of very great service in this particular. The young men who finished their full course in the Agricultural Institution of St. Petersburg have practically all entered the service of the Crown in the several departments of the Ministry of Crown Domains, and some of them occupy now very eminent positions, either as professors of agricultural schools, or in other departments of rural economy.

To the Goretsk school only young men of sixteen, who had finished the public school, were admitted. The course was four years and was the same as in the two-class agricultural schools of the present time, but with the addition of the first principles of geometry and surveying, practical geodesy, drawing of plans, and special sciences, such as agriculture, stock farming, rural technology and book-keeping, and the management of estates. In the Goretsk school very little of natural sciences was taught, while in that of Moscow the pupils were also instructed in physics, chemistry and botany.

Besides the two above mentioned schools a third was opened in 1855, in the town of Kharkov, with the same regulations as in that of Goretsk. Those who finished the course in these schools generally became stewards on private estates. For the lower instruction in agriculture, according to the statute of 1841, eight farms were organized in the forties on Crown lands in the different localities of Russia. These farms were designed for preparing young peasants to be expert farmers and for making experiments looking toward improvements in the industry.

Young men from sixteen to twenty, able to read and write, were admitted as pupils to these farms. The teaching here was exclusively practical and consisted in labour on the farms and in studying the best methods of agriculture. The course was four years and corresponded to that of the lower schools, adding thereto the fundamental rules of agriculture and of veterinary surgery by simple means; they also were instructed in the duties of the peasant according to the police statutes. Schools of these three different grades existed in Russia also for the teaching of gardening. According to the statutes and instructions edited in 1842 and in 1847 with reference to schools, they were divided into three categories as follows: to the first belonged the Principal school of gardening, then established in the town of Odessa and which aimed at preparing scientific gardeners. The full course was four years; the pupils who finished there with the highest averages were sent for practical work to the Nikitsk garden on the southern border of the Crimea, or to some other similar institution. The admission and graduation of pupils took place only once in four years. In 1859 this school owing to its bad position was transferred to Uman, government of Kiev, and consolidated with the celebrated Sofievska Garden, which formerly belonged to the Count Pototski. Those of the Uman school pupils who wished to be perfected in gardening and viticulture were also sent to the Imperial Nikitsk Garden.

To the second category belonged four schools of which two, of Penza and of Ekaterinoslav, had existed before and the two others, one near the town of Kishiniev and the other in Astrakhan, were established afterwards. To this category belonged also the Magarachsk school of viticulture in Nikitsk Garden. These former schools were designed for making practical gardeners, and the latter for preparing grape growers, vine dressers and wine makers. In 1859 the Astrakhan and Ekaterinoslav schools were closed and the Magarachsk school was transformed in 1869, together

with the nursery of Nikitsk garden, into the Nikitsk gardening and vineyard school. To the third category belonged the nursery gardens which tended to the developing of gardening in the different localities by spreading sprigs, cuttings and seeds of fruit and plants, the most appropriate to the given locality, and also to the preparing of peasant boys to be scientific gardeners. There were no class studies in those nurseries.

There were eight nurseries established in the different parts of Russia of which six being in unfavourable localities and on unfertile soils were of little use and were closed. Of the two remaining, the Voronezhsk and Orlovsk, the former was transformed into a fruit garden and the latter into a simple dendrological nursery. In 1868 a fruit garden and nursery was organized in the town of Gorki. All these establishments were founded for the spread of the best varieties of fruit trees. Peasants were sent to these farms and nurseries either by order of Government or by their masters or landowners. After finishing their course they returned to their former positions.

In the fifteen years, during which farms and nurseries existed for the teaching of boys, the number of pupils who had finished their full course may be enumerated as follows: on the farms to 1865, 2,410 pupils, and in garden establishments to 1869, 849, of which 518 were in garden schools and 331 in nurseries. Without doubt the young men who had been trained on those farms and nurseries, were of great use to their masters; however, the peasant farms were but little improved by the organization of schools of the second and third categories, as most of the pupils on returning home became the same common workmen as their fathers, and continued to follow the old systems of farming.

The principal reasons why the schools of the second and third categories were not more effective were due to the fact that the pupils were too little taught to study special branches; there was no elementary instruction in the natural sciences, preparatory to the study of special subjects; the boys often attended these institutions not from choice, but under the compulsion of their superiors or landowners, and therefore, they looked upon the whole course in the light of an unpleasant duty which they were forced to perform; finally not only the peasants, but even the landowners themselves did not feel the necessity of improvement in their methods of agriculture.

#### C O N T E M P O R A R Y S C H O O L S.

Since the ascension to the throne of Emperor Alexander II, and since the liberation of serfs in 1861, and of Crown peasants from the jurisdiction of the Ministry of the Crown Domains, the system of developing the agricultural industry in Russia has completely changed.

#### H I G H E R A G R I C U L T U R A L S C H O O L S.

The Ministry of Crown Domains, being aware that since the liberation of the serfs the landowners were in great need of instruction in farming, became very active in disseminating the science of agriculture among them.

First of all the Ministry found it necessary to develop the higher agricultural schools. To that end in 1861 was laid the foundation of a new Higher School near Moscow, called the Petrovsk Academy of Agriculture and Forestry, which was opened

in 1865. Wishing to give access to all landowners, even to such as had not received a middle school education, or to such as had been so educated but owing to their mature age might not be able to sustain any special literary trial, it was permitted, according to the statute of 1865, to enter that Academy without undergoing a preliminary examination, and without any certificate. All the natural sciences were read in the Academy, as well as physics, chemistry, geodesy, practical mechanics, political economy and veterinary surgery, and also in one section, agriculture, and in the other, forestry. According to the rules of the school there were 18 professors for teaching the above mentioned sciences. The Academy was empowered to give to those who had finished the full course the degree of Bachelor, and Master of Agriculture or Forestry, and those who were able to secure such degrees had the same privileges as the University bachelors and masters. Only stipendiaries were examined and those who wished to acquire a scientific degree. The tuition to the lectures was 12·50 roubles per semester. But those who did not wish to pay the full half-year tuition could pay at the rate of 15 kopecks per lecture. But the expectations of this Academy were not realized. As the access to the lectures was open to all, not only persons who were well enough educated and really interested in the agricultural sciences came to listen to them, but even those attended who were not at all able to understand them. The results were that from 1865 to 1872, of the 1,034 persons who frequented the lectures only 36, 3·5 per cent, finished the full course. Some left the Academy with certificates, showing that they had passed one or more examinations, and others left without any certificate whatever. Consequently in 1872 new rules were formed for the Academy, according to which only persons, who had finished the whole course in the middle schools, were entitled to admission. The students were obliged to remain during the whole course, which was four years, undergoing the yearly examinations; on graduation they received either the degrees of Student Active or Bachelor of Agriculture or of Forestry. The same rules were adopted in the new statute of the Academy, which was established in 1873. Accordingly the Academy was transformed into an ordinary Higher School of Agriculture and Forestry. The tuition for attending the lectures was raised to 20 roubles per semester for regular students, and 75 roubles for special students, the latter being required to be of age and to have a certain social position. The first year, after the school was transformed, there were only 100 students in attendance; but the number increased gradually and in 1877 amounted to 339.

Due to this increase, as also to the fact that the Farming Section of the St. Petersburg Agricultural Institution did not prosper, because there were no farms connected with the institution, and because its location was too far north, it was found better to close the section and to transform it into an Institution of Forestry. Therefore in 1883 no more students were admitted to the forestry section of the Petrovsk Academy, and in 1887 this section was abolished. After the closing of the forestry section, the number of students finishing the full agricultural course was from 1883 to 1887, thirty; in 1887, fifty-nine; and the following years, sixty on the average.

From 1887 the Petrovsk Academy began to edit a periodical magazine entitled, *The Academic News*, and in the same year it published a Series of Informations of the Petrovsk Agricultural and Forest Academy, containing many data gathered and worked out by Professor Schoene, concerning the activity of the school and of those who had studied therein. From these data and from complementary information, edited

till April, 1890, it may be seen that since the transformation of the school in autumn 1872 until 1891 there were in all 1,712 students. Of this number 1,608 left before February 10, 1893, of which 672 students had not completed the full course, 936 had finished, and 28 were special attendants. Added thereto the 36 persons who had been graduated before 1872, the total number was 1,000 students who had completed the full course. Of the 1,651 students who had entered the Academy during the seventeen years, from 1872 to 1890, only 964 had finished the full course, averaging 57 persons per year. Thus those who were graduated form 60 per cent of the total number of students.

Taking into consideration that in the Russian universities, according to information given by the Ministry of Public Instruction in 1887, only thirteen per cent of the students complete the full course, consequently 52 per cent during four years, the proportion of such students in the Petrovsk Academy is very considerable. The maintenance of the Academy during the given period costs the Government 145,620 roubles annually, and each of the 57 students who had finished the course, 2,554 roubles. Furthermore, taking into consideration that on the average, 322 persons studied yearly in the Academy, it will be found that each of them cost the Government 452 roubles. These figures are manifestly too low as in the universities where the number of students is much greater, each student who finished his full course in 1887 cost the Government 1,721 roubles, and such as left before graduation, 226 roubles each.

The above mentioned publication gives also interesting information concerning the occupations of the former students of the Petrovsk Academy. From these data it may be seen that until January 1, 1890, 2,444 persons had left the Academy. Information has been obtained only with reference to 1,443 students, of which 109 died soon after leaving the institution. Of the remaining 1,334 former students, 1,097 or 82·23 per cent, have devoted themselves to agriculture and forestry or to such occupations as are closely connected therewith. Of this number 700 had finished the full course and the remaining had dropped out at different stages; 237 persons, or 17·77 per cent, have chosen a calling which has no connection with agriculture or forestry, of these only 47 finished the full course.

In 1889 by Imperial order a new position and personnel were established for the Academy, thereupon the Ministry of Domains issued a new statute governing it. According to this law the academy was transformed into an exclusive agriculture school. The course began on the 1st of January, and those who wished to enter the academy had not only to finish the course in one of the middle schools but also to practice farming for six months. Those who were graduated from this Academy received as before the rights of the university, but for the degree of Master of Science the student was required to finish the course in the university, under the Faculty of physics and mathematics. Practical studies and the special sciences were enlarged. Instead of fixing stipends for the students they received subsidies. The tuition for attending lectures was raised from 40 to 50 roubles a year. At the present time it is proposed to establish instead of the Petrovsk Academy, two higher schools of Agriculture one in the Chernoziom and the other in the non-Chernoziom regions of Russia.

Besides the Petrovsk Academy two other higher schools of farming were organized in the sixties, one the New Alexandrian Institution of Agriculture and Forestry, in the Vistula region, and the other the Riga Polytechnic School in the Baltic provinces. Both of these schools are under the jurisdiction of the Ministry of Public Instruction. In the New Alexandrian Institution, since 1872, when the first graduation of students took

place, until the present day, 243 students have finished the full course. In 1893 this institution was reorganized; the course became four years, all the rights of the universities were given to it, and it was considerably endowed. In the Riga Polytechnic School, in the agricultural section there have been in attendance during recent years about 100, and in 1891, 111 pupils; since 1886 when it was opened, 95 students completed the full course, of which 15 were graduated during the last year.

### MIDDLE SCHOOLS.

To the three middle schools of agriculture which existed before, two more were added in 1865. These were the (Kazan and Mariinsk) schools, the latter near the town of Saratov, reorganized from local farms. Later on, soon after the organization of these schools the course of study as adopted was not considered satisfactory, especially with reference to natural sciences, too little importance being assigned to them, except in the school at Moscow, where they were more seriously considered. Therefore, an Imperial resolution was passed in 1868, to the effect that the natural sciences should be more thoroughly taught in the agricultural schools, as well as the co-called special branches of study. In harmony with this movement the number of professors and their salaries were considerably increased. In all these four schools the course was five and one half years, of which four and one-half were devoted to theoretical studies, and the last year, exclusively to practice on the farms.

In 1868 the principal Garden school in Uman was also transformed into an agricultural establishment, subject to the above mentioned rules, with the exception that special attention was paid to the teaching of gardening. The number of pupils in the sixties amounted only to 160 in the Moscow school, and in the others before their reorganization, it was much less, namely in the Goretsk school, 85, and in the remaining, that is, in the Kharkov, Kazan and Mariinsk agricultural schools and in the Uman garden school, there were only about 60 in each. But since the reorganization of the agricultural schools the number of pupils and of students finishing the full course has considerably increased.

The total number of students graduated from the middle agricultural schools, since their foundation until 1881, amounts to 2,371. Although these students, after finishing their course, always found occupations and principally as managers of private estates, still it was found that they were not sufficiently qualified, nor well adapted to the different local conditions and requirements of the farming industry. The reason for this state of affairs was found to lie in the fact that the general instruction in the above named schools was not sufficiently practical, corresponding too closely to that of the two-class village schools, whilst the teaching of natural and special sciences was especially developed. Consequently the attention of the Ministry of Crown Domains was drawn to these and other defects in the organization of these schools, especially to the small means appropriated for the maintenance of practical study and work. The Ministry together with the Directors of the schools in question worked out a new statute which was legally confirmed on the 30th of May, 1878. According to this statute the general course in the agricultural schools was made the same as that established by the Ministry of Public Instruction for professional schools, with the difference only that the natural and special sciences were to receive extra attention. For entering these schools the pupils were required to

pass the full course in the district, town or two-class village schools. The course in agricultural schools was increased from five and one-half to six years. Since the reorganization of agricultural schools in 1878, those who finished the full course therein acquired not only the rights given to graduates of the middle schools, but also certain additional privileges. Moreover the best pupils had the privilege of entering higher special schools under the Ministry of Crown Domains.

Since the reorganization of 1878, the appropriation for the maintenance of these institutions was increased from 20,000 to 37,000 roubles each, independent of the sums, fixed for the keeping of farms, for the five-year increase in the salaries of the teachers, making the entire appropriation 43,000 roubles.

The Moscow and Kherson agricultural schools were also subject to the statute of 1878. In the latter school, founded in 1882 by the Kherson Zemstvo, the course of study was six years not counting the following obligatory year of practical study and work on the farms. The Zemstvo gives yearly 35,000 roubles for the support of that school together with the annexed farm, and the Government 8,200 roubles, independent of the sums for increasing the salaries of teachers every five years.

Thus, since 1882 there are seven middle agricultural schools in Russia, all of which not only prepare managers for private estates, but also answer many other practical and educational purposes. The students after finishing the course in these institutions either become estate bailiffs, teachers in lower agricultural schools, or after post-graduate study become specialists in the different branches of agriculture, as for example, in gardening flax cultivation, tobacco growing, wine making, milk farming, stock raising, et cetera. Sections for the study of certain of these branches have been established at the several agricultural schools. Thus, for the study of sheep farming a section with a two years course, has been joined to the Kharkov school, and for gardening and wine making, higher courses of two years have been opened at the Imperial Nikitsk gardens; both of these sections are of great value. The seven schools mentioned above form the centre of agricultural education in Russia. Although each of these schools principally furnish specialists to the region round about them, still the students are spread over all Russia and have gained already a fine reputation. These institutions are always full, and those who wish to enter are received only after a competitive examination. At the beginning of 1893 in the seven schools there were in all, 1,153 pupils, and the total number of those who finished the full course during the last ten years amounted to 1,038. Since the foundation of these schools 3,409 students have been graduated, of whom the yearly average number during the last ten years is 106, and during the last three years, 116. In all, 2,322 students have studied in the seven schools during the last ten years, of whom 972, or about 42 per cent, have been graduated, 1,350 or about 58 per cent having dropped out at different stages of the course. The percentage of the former is very considerable, especially as the full course is six years.

Taking into consideration that the average number of pupils in the seven schools formed, during the last three years, 1,140, that the maintenance of these schools, together with their farms, costs the Government 256,000 roubles yearly, that the Kherson Zemstvo adds to that sum 35,000 roubles a year for the support of the Kherson school, and that consequently about 291,000 roubles are devoted annually to this purpose, it will be seen that the education per pupil amounts to 255 roubles, not counting of course the sums paid by the special students. The cost of the 116 pupils who completed the full course every

year amounts to 2,508 roubles. These expenses are very moderate compared to those of the professional schools where, notwithstanding the large number of pupils and the systematic use of inexpensive school books, the cost per pupil is 180 roubles, and that per graduate, 1,824 roubles.

### FARM SCHOOLS.

Agricultural schools owe much of their success to the farms connected therewith. Besides those formerly in existence, such as the Moscow farm and four others annexed to agricultural schools, in 1865 another was joined to the Petrovsk Academy, and later on, six more were founded, as follows: one, at the Uman school of Gardening and Agriculture in 1878; two, at the Kherson school in 1882; three, at the Uspensk school; four, at the Marino-Gorsk; five, at the Utkinsk and six at the Mainovsk.

The area of land occupied by these twelve farms covers 6,840 dessiatines; consequently, each farm occupies on the average 570 dessiatines. Ten of these are well organized and the other two, the Utkinsk and Mainovsk, are only now being put in order. Their principal aim is to assist the students to which they are annexed in the study of practical agriculture in its entirety and in its separate branches and methods. Moreover, they are required to help private landowners as far as possible to improve their estates by supplying them with good seed, with improved farming implements, and with good breeds of stock.

The farms which were formerly established have considerably developed and improved during late years, due largely to the introduction in 1875 of a new statute relative to the incomes of Crown lands. According to this statute the Crown farms were no longer required to give their revenues over to the Government, but the entire Crown rental could be employed in improving the farms. Each farm received from the Government a small endowment at the time of its establishment which served as a floating capital, tending to its support. The aggregate of the sums given to the farms, and to the six gardens, amounted to 56,500 roubles. At the present time these totals have increased to 113,700 roubles, notwithstanding that during these 18 years many considerable improvements have been made at the expense of the endowment fund.

At the present time five more farms are about to be established in connection with the other agricultural schools. Thus, there are now seventeen farms which are under the jurisdiction of the Ministry of Crown Domains, and serve for the development of agriculture in Russia. Besides these seventeen there are others, annexed to lower agricultural schools, established by private persons and by the Zemstvos.

### LAND SURVEYING SCHOOLS.

At the Gorigoretsk Agricultural Institution, according to the report of the Ministry of Crown Domains, confirmed by His Imperial Majesty in 1858, classes in land surveying were established. This was brought about by the forthcoming liberation of the serfs and the granting of lands to peasants, as the aim of these classes was to make the peasants able to survey and measure their own property. To these classes were admitted boys of sixteen years, of all classes of birth, who had finished at the district schools. The course in these classes was two years and consisted of topography, levelling, land measuring, natural sciences, plotting and the principles of land surveying.

During the summer months the pupils enjoyed practical lessons in land surveying,

under the direction of special instructors, and in measuring under that of their regular teachers. The average annual number of such pupils amounts to 30 and of those who were graduated, 10 to 16. During the 31 years of the existence of these classes, since 1861, 366 persons finished the full course.

The pupils who have successfully finished the course receive a diploma and the right to be called private land and forest surveyors and to survey private and Crown fields and woodlands. They enjoy a second grade exemption from military obligation and may enter the Government service in the quality of surveyors.

#### GARDEN SCHOOLS.

Schools designed for the development of the industry of gardening were founded in Penza, Bessarabia, near Kishinev, and in the town of Verny of the Semirechinsk district; hereto must be added the Nikitsk school of gardening and viticulture. The latter was founded in 1869, and the statute for its support was passed the same year. According to this statute the principal aim of the school was to prepare gardeners and wine makers. The course, of 8 years, was the same as in public schools, adding thereto the study of natural history, of gardening and wine making. Pupils were admitted not younger than 13 years, and were required to speak Russian, as the local population were Tartars.

In 1877 great changes were made in the school: the course was shortened to 6 years, of which four were designed for theoretical, and two for practical studies, principally of gardening and viticulture, in private gardens during the summer. In winter those pupils who wished to be gardeners, studied that branch theoretically, and those who wished to become wine makers, correspondingly studied the theory of viticulture. Boys older than 14 were admitted to the school, and such as had finished the course in public schools. The sum for the maintenance of the schools was increased and amounted to 37,000 roubles a year.

The vine dressing and wine making industries in the Nikitsk garden, as well as in Magarachsk school connected therewith, have greatly developed lately. The area under vineyards has increased to thirteen and one-fourth dessiatines, the number of vines, to 140,905, and the quantity of wine produced, to 3,000 vedroes yearly. The Magarachsk wine has attained a high reputation and is latterly no more sold in vedroes but in bottles, on the spot. The profits from the sale of this wine amounts to 18,000 roubles a year. The fruit garden and nursery cover 5 dessiatines.

The Garden School of Penza remained without alteration until 1880, when owing to the closing of the Apiculture School of Prokopovich, which existed in the government of Chernigov, upheld by the Government, a model apiary was annexed to the Penza school, and a full course of apiculture opened in connection therewith. It was decided to transform the Garden School of Bessarabia into a school of viticulture, and therefore that institution was closed in 1891, and the pupils sent to other institutions. The Verny Garden School was established in 1887 in Semirechinsk district, town of Verny, for instructing boys in gardening, forestry and the silkworm culture. The course of study and practice was 4 years.

The number of pupils in the 4 above mentioned garden schools has considerably increased during the last 10 years, namely, from 91, in 1883, to 144, notwithstanding the closing of the school in Bessarabia. The number of gardeners and wine makers who had finished their course during the years, 1869 to 1892, amounted to 291, so that on the average 15 persons were graduated annually in each of the garden schools.

The greatest number of pupils was in the Nikitsk school, amounting on the average to 55; at the present time there are 78, and during the last 9 years, since the application of the rule permitting of annual graduation classes, 55 have finished the full course, or 6 pupils per year. Altogether 129 students have been graduated since 1869.

In the Imperial Nikitsk Garden, except regular students, there are always special practice students of the 1st and 2nd categories: three of the 1st grade, who receive a Crown stipend and are admitted of those who have finished their course in the Uman Agricultural and Garden School, study theoretical and practical viticulture and wine making in the Magarachsk vineyards. To these practice students lectures on wine making are delivered for two years. Since the introduction of these higher courses, in 1869, 44 have finished the full special studies, and all occupy different places as wine dressers or wine makers in the Crimea, the Caucasus and even Tashkend, and have tended much to the development of these industries. Owing to the latter fact the Don Cossacks, sanctioned by His Imperial Majesty, support at their expense in the Nikitsk garden three practice students, of such as have finished their course in seminaries; they are afterwards made teachers in public schools. Since 1888 it is permitted to accept practice students from other schools, on condition that they pass the three years course of special sciences together with the pupils of the Nikitsk Garden school. During the last 5 years, 18 of such practice students have completed the course in Nikitsk garden.

During late years it has been observed that the garden schools of Russia do not fully answer the present demands and that their usefulness could be greatly improved, if otherwise managed. It has been therefore decided to reorganize them and to establish others. At the present time a new statute covering all garden schools has been passed, and consists of the following features:

1. The aim of the garden schools is not only to prepare specialists of the different branches of gardening, but also to make trials and experiments, and to spread among the local population improved types of useful plants, together with the best methods of their cultivation.
2. The lower garden schools are divided into two categories, first and second, and instead of the higher school, special courses of wine making, in Nikitsk garden, and of gardening, in the Uman school, are to be organized.
3. The schools existing in Penza and Nikita are to be transformed into schools of the 1st category.
4. The garden school of Bessarabia is to be transformed into a school of viticulture, with a course corresponding to that of the middle agricultural schools.
5. The Uman school of agriculture and gardening is to reorganize into an exclusively agricultural school, and for the teaching of gardening to establish a new school of the 1st category.
6. It is decided to found at Government expense two garden schools of the 2nd category, one in Voronezh, and one in some other locality, found to be the most suitable.
7. It is decreed to considerably increase the sums given to all garden schools for the maintenance of the Faculty and the pupils, for books, and for making experiments.

Besides the garden schools, the Ministry of Crown Domains has under its jurisdiction the Imperial Botanical Garden in St. Petersburg, and the Imperial Nikitsk Garden on the southern border of the Crimea, near Yalta.

The Botanical Garden of St. Petersburg was founded in 1823. It was transformed

from the Apothecary Garden, which was organized by the order of Peter the Great in 1714. At first the Botanical Garden was under the jurisdiction of the Ministry of the Interior, and in 1830 it passed to that of the Ministry of the Imperial Court, and served principally for keeping and increasing first, only medicinal, and then decorative plants. The garden passed under the jurisdiction of the Ministry of Crown Domains only in 1863. Afterwards it entirely changed its character, and tended to more scientific uses. For the better attainment of these aims it was intimately connected with the Imperial Academy of sciences and with the practical schools of the Empire.

In November 1866 new rules were legally confirmed and a new Faculty appointed for the Botanical Garden. A permanent Faculty, with an endowment of 60,000 roubles, was finally introduced in 1870. Later on, this sum was increased to 76,000 roubles, besides an annual appropriation ranging from 5,000 to 10,000 roubles for the repair of the buildings and care of the grounds.

In 1863 the Botanical Garden grew 16,500 different species of plants. In 1868 this number amounted to 19,714, and in the following years it gradually increased and attained in 1892, 25,692 species, of which 24,252 were hothouse plants. The total number of growths amounts to 72,560. The hothouse varieties are grown in 24 different hothouses, and besides, there are 144 hotbeds for their cultivation.

The Herbarium of the Botanical Garden includes many important collections of dried plants. The most noted of these are: the herbarium of the former director of the garden, Fischer, which contains 60,000 different varieties of plants, and that of Professor Ledebur; both of these herbaria were given to the Garden by the widows of the collectors. In all these collections there are some very important samples, by which not only Fischer and Ledebur, but also other botanists have described the new species of the Russian flora. The herbarium of Ledebur is a full commentary to his celebrated work "Flora rossica", which serves as a foundation to all new works on the flora of the Empire.

In 1864 the herbarium of the Botanical Garden consisted of 4,790 large packets, and in 1871 of 5,507, of which 216 separate collections were formed. In 1877 there were 5,678 packets, in 1887, 6,314 and the 1st of January, 1892, 6,412 packets. This herbarium is considered one of the richest in the world, so that until now foreign botanists seldom begin a large work without asking the St. Petersburg Botanical Garden to lend them plants from its herbarium.

The Museum of the Garden consists of 4 collections: carpological, dendrological, paleontological, and the collection of plant products, which contain about 40,000 pieces.

The library of the Garden contains about 12,000 works, and the number of volumes amounts to 25,000. The Faculty of the institution also takes part in these works. Since 1871 the Botanical Garden edits a special magazine of which 11 volumes appeared previous to the close of 1892.

The other botanical garden, namely the Imperial Nikitsk, which is also under the jurisdiction of the Ministry, has been described above. The difference between the two gardens consists in the following: the Garden of St. Petersburg is principally occupied with hothouse plants, and with making herbaria and collections, while the special aim of the Nikitsk Garden is to acclimatize plants of the southern countries to open air life; the St. Petersburg Garden is afforded better means and opportunities for scientific investigations, whereas the Nikitsk Garden takes more the character of a school.

## LOWER AGRICULTURAL SCHOOLS.

When the middle agricultural schools had attained a sufficient development, the Ministry of Crown Domains began to establish lower grade schools. These were organized one by one, and thus during 10 years, from 1871 to 1881, six were established. The first, founded after the school farms had been closed, was a dairy school opened in 1871 in the government of Tver, in the village Edimonovo, on the Volga. It was first organized by Vereschagin, a retired lieutenant, with the aid of the Economic Society and the Zemstvo of the Tver government. But later on, the Zemstvo, as well as the Society, withdrew their aid and the school was exclusively supported by the Government. The Ministry of Crown Domains and Finance contributed much to the maintenance of the school and laboratory, and to the organization of peasant cheese dairies, independent of the regular endowments, consisting of 15,000 to 20,000 roubles a year, of which 4,000 were stipends to students, 40 roubles for each of the students in attendance, and 4,000 salary to Mr. Vereschagin himself. The school admitted pupils of both sexes without any restriction as to age or qualifications, those who had finished their course in higher schools, as well as those who did not know how to read and write. The number of pupils was above 80 per year. There is no theoretical course and no fixed plan for practical studies in the school. Those who enter are allowed to remain as long as they like and permitted to study butter and cheese making in Endimonovo, or in one of the neighbouring peasant cheese dairies. Such as have learned one of these trades are recommended by Vereschagin to some private establishment.

Thus during sixteen years until the end of 1887, 552 persons had attended the school of whom, as may be seen from the report of Vereschagin, 408 finished the course and only 309 continued to occupy themselves with milk farming, 158 men and 151 women. During that time Vereschagin received besides the sums given him by the society and Zemstvo, 389,000 roubles from the Government. In 1888 and 1889, he received for the maintenance of the school 30,650 and from 1888 to 1892, 53,650 roubles, besides the 45,000 which were contributed to Vereschagin in 1890, to make up for his expenses during the organization of the school. From 1888 to 1892, 148 persons had been instructed in that school, 72 men and 76 women; consequently each pupil cost the Government 362 roubles.

The second lower school was the Goretsk trade school, founded in 1872 for preparing workmen for making farming machines and implements. A mechanical factory, and workshops are annexed to the school, in which the boys learn to make and mend the most general machines and implements, and for that purpose they are instructed in joinery, wood turning and polishing, locksmithing, soldering, and in the smithies in general. The full course is five years. Besides the ordinary subjects the following literary studies are taught: physic and general mechanics, metal and wood technology, agricultural mechanics, and the construction of agricultural machines and implements, tracing and geometric and technical drawing. For the maintenance of the school, 3,900 roubles were formerly given annually. The average number of pupils during the last three years has been about 40, and since 1877, 55 persons have finished the full course, on the average 4 persons a year. At the present time the permission of His Imperial Majesty has been asked for granting 3,500 roubles a year more for the support of the

school, in order to be able to have more expert teachers and greater means for supporting the workshops. Consequently it is proposed to make great reforms in the school and to pass a new statute to govern it.

To the category of agricultural schools established according to special regulations, belongs first of all a school founded in 1863 by the nobility of the Courlandian government, on its estate Alt-Saten. The foundation capital of the school was given by a Mr. Sokovich. In 1877 the school passed into the hands of the Ministry of Crown Domains. Next come three schools established by Imperial order, namely, the Marino-Gorsk, in the government of Minsk in 1876, the Utkinsk in the government of Kostroma, and the Uspensk in the government of Vladimir. The two latter were founded in 1881. The Utkinsk school is maintained by Utkin, the Marino-Gorsk, by private contributors, and the Uspensk school is on an estate belonging to the Government. These four schools serve to prepare farm bailiffs. The total number of pupils is from 200 to 220, and of those who finish the full course, from 40 to 50 a year.

As the organization and maintenance of the above mentioned lower schools are very expensive the number of pupils finishing the full course was rather small, and the demands for expert farmers considerably increased, being wanted not only for private estates but also for peasant farms, the Ministry of Crown Domains, at the beginning of the seventies, came to the following conclusions: that it was very important to increase the number of lower agricultural schools; that the cheapest and simplest method would be to establish them on well organized estates, believing that theoretical teaching could be better combined with practice on such estates than on Crown lands. Consequently in order to hasten the organization of such schools the Ministry proposed to establish a general statute to cover them. This statute was confirmed by His Imperial Majesty, December 27, 1883, and contains the following principal points:

1. The aim of the lower agricultural schools is to spread among the population the fundamental principles of farming and of the trades connected therewith, principally by practical studies and work.
2. These schools are to be founded by private persons, by Zemstvos, or by societies, on lands pertaining thereto or granted by the Government for that purpose.
3. The course of these schools are divided into two different grades, namely: a general, for the teaching of agriculture, and a special, for its different branches, such as apiculture, gardening, wine making, the dairy and the like.
4. All the pupils are required to work gratis on the farm belonging to the school, or to the founder of it, but after one year a small salary may be given them.
5. The lower schools may be of two categories, first and second, but the course in both is the same, and of three years. One or two preparatory classes may be annexed to the school.
6. Boys not younger than 14 may enter the schools of either category. Those who enter the first category must previously finish the course in a two-class village school, and such as wish to enter the second category, in a one-class village or public school. To the preparatory classes, pupils with very limited education are admitted.
7. Besides reviewing the general sciences the pupils are to be taught natural sciences and given a short course of agriculture.
8. In winter the pupils study in classes and the summer is consecrated to practical studies.

9. After finishing the course the pupils before receiving a diploma must practise for one year on other farms.

10. The Government contributes from 1,500 to 3,500 roubles a year to agricultural schools, according as they belong to the first or second category and to the number of the preparatory classes. This sum is given only for the maintenance of the Faculty and for books.

11. In schools supported by the Government a smaller number of pupils is admitted. With the founder of a school a special contract is concluded with the Department of Agriculture and Rural Industry, in which are stated the rights and obligations to the school both of its founder and the proprietor of the estate on which it is opened.

12. Those who serve in the schools are freed from military conscription and enjoy all rights attaching to the Civil Service, and at the end of each five years service receive from the Treasury an augmentation to the amount of a quarter of their annual salary, till such time as the originally appointed salary shall have been doubled.

13. Special normal statutes for Dairy Schools have been drawn up and perfected by the Minister of Imperial Domains in mutual agreement with the Minister of Public Instruction. In the statutes of these schools the following points are noted in distinction to the statutes of ordinary Rural Industrial Schools: Dairy Schools may be established on all private estates where a regular dairy industry is carried on, where there are not less than 80 milch cows, and where each cow gives not less than 100 vedros or 75 pounds of milk. The school may be either for boys or for girls. The number of pupils in each school must not exceed twelve. A Treasury subvention is accorded both for the salary of the director or directress and the teachers of the school, as well as for the maintenance of the pupils. The course of studies extends over a period of two years, followed by a supplementary term of six months to one year for practical training in other branches of rural industry.

The number of applications for permission to establish elementary schools in accordance with these statutes is so great that the Ministry is not in a position to satisfy them all out of the funds assigned for the purpose, notwithstanding that, including the sum of 12,000 roubles originally set apart in 1844, these funds already amount to 93,000 roubles, independent of the subsidies granted to dairy schools. Out of this sum, up to the present moment, 50 regularly founded schools have been opened, of which 40 are already in full work. Of these 50 schools, 35 have been working from 1 to 8 years; 5 were opened only in 1892; and the remaining 10 will be opened in 1893, as soon as the necessary buildings are completed. Subventions from the Treasury are granted to 34 of these 50 schools, five of them having been founded by private contributions. The entire sum of these subventions amount to 83,000 roubles, giving an average sum of 2,456 roubles for each school, the founders expending on their own account 125,025 roubles, and on the account of the County Council (zemstvo), 32,221 roubles, for the maintenance of 8 schools and in part aid of some of the other 34 schools. The founders of the schools further take upon themselves all other expenses for their maintenance in due order. Independently of this, out of the funds set apart for the dairy industry, 19,782 roubles, that is, 2,473 roubles for each school, are granted to 5 dairy schools and three girl schools for training in rural industry and domestic economy. Eight schools are kept up without any subvention whatever from the Government.

In 31 Rural and Garden Industrial Schools 1,272 scholars are being now educated,

giving for each school an average number of 41, and in 1892, 139 pupils in 15 of these schools, had already finished their course of studies.

The maintenance of these 31 schools costs the government 67,500 roubles, each pupil therefore costing only 42 roubles, notwithstanding that several of the schools have only recently been opened and the full number of pupils for that reason cannot as yet be complete. The sum expended on these schools by their founders and by the County Councils (zemstvos), amounts in all to 128,711 roubles, and consequently the cost of each of the 1,272 pupils will come to 101 roubles. In general, the maintenance and instruction of each pupil in the rural industrial schools costs the Government and their founders about 143 roubles.

The number of pupils received into the dairy schools is purposely limited, in order to secure for them a better and fuller training both in the care of cattle and in every branch of the dairy industry. In all the five schools there are not more than 55 scholars, giving the average number of 11 for each school, and as 12,782 roubles are assigned by the Treasury to these schools, it may be reckoned that each scholar costs 232 roubles.

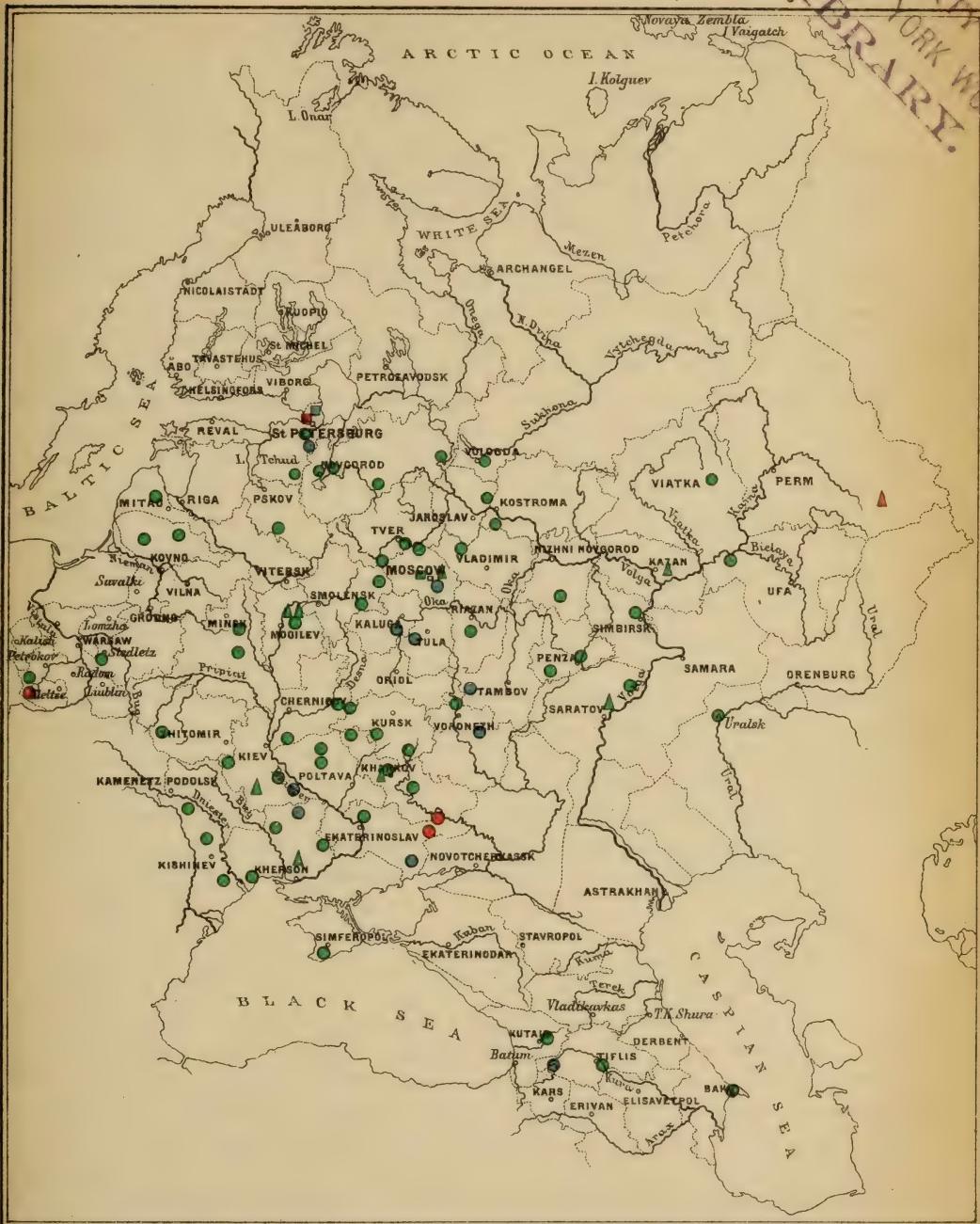
Besides the dairy schools already mentioned, into two of which, the Edimonovsk and Pavlikovsk schools, girls may also be placed; during the last few years a number of schools designed exclusively for girls have been established in different parts of Russia by the aid and with the concurrence of the Government. Into these schools are received girls not younger than 16, and who must previously have gone through the regular course of studies at one of the national schools. They are instructed in those branches of rural and domestic industry with which women have generally to occupy themselves, namely: the management of the dairy, bird breeding, gardening, kitchen gardening, cooking, sewing, nursing, et cetera. The course extends over two years. Two such schools have already been founded: one by Madame Mariouts in the Kiev government, and the second by Baroness Budberg in the Kovensk government. An annual subvention of 3,000 roubles is granted to the first, in which there are at the present time 33 pupils, and the sum of 2,000 roubles to the second, in which there are now 25 pupils. The official statutes for a third such school, the School of the Transfiguration, already founded and opened by the widow of Privy Counsellor Nepluev in the Chernigov government are not yet confirmed.

Thus, under the administration and care of the Department of the Ministry of Imperial Domains there are at the present moment in all, 68 rural industrial schools. The sums expended on their maintenance and the number of pupils receiving instruction in these schools are set forth in the following table.

Class and Number of Schools.	Pupils.	Cost of Maintenance.		Total.
		From Government.	From Zemstvos and Founders.	
Higher schools. . . . .	1 111	141,302	—	141,302
Middle schools. . . . .	8 1,186	224,668	36,000	260,668
Lower schools on a special footing. . . . .	9 463	82,952	13,900	96,852
"    "    " the normal footing at work.	40 1,397	91,782	135,811	227,593
Lower schools on the normal footing, opened 1893 . . . . .	10 —	15,000	65,500	80,500
Total . . . . .	68 3,157	555,704	251,211	806,915

MAP OF  
EUROPEAN RUSSIA  
showing the different schools which are under  
the jurisdiction of the Ministry of Domains

## Chapter XIII Agricultural schools.



CARTOGRAPHICAL WORKS OF A. JIIN ST PBG.

**Signs used to designate the different schools:**

I. Agricultural Schools II. Forestry Schools III. Mining Schools.

■ *Higher*

**▲ Intermediate**

● Primary

■ *Higher*

## • Primary

### ■ Higher

▲ *Intermediate*

● Primary



The distribution of these establishments over all Russia, as well as of those of mining and forestry appertaining to the same Ministry are shown in the accompanying map with explanatory notes.

Besides the above-mentioned Middle Schools of Rural Industry, which are under the supervision of the Ministry of Imperial Domains, there are like schools under the administration of the Ministry of Public Instruction. These are two Professional Schools (*Reale Schulen*) one at Krasnooufimsk in the Perm government, and the second at Melitopol in the Taurid government.

Much attention has lately been directed to the idea that instruction in rural industry, and particularly in the garden and kitchen garden industry, might with profit be given to the pupils of the national schools. Accordingly, in 1890, the Minister of Imperial Domains solicited Imperial permission to open special classes for training teachers of these subjects for the national schools. These courses were given during the summer in the educational establishments of the Ministry, and were supplemented by regular practical training under the immediate direction of the tutors of these establishments. During the last three years similar courses have been opened in many of the schools of rural and garden industry. Thus, in 1892 such courses were held in no less than 11 ministerial educational establishments, and were attended by 315 national school teachers. A sum of 2,180 roubles was devoted to the proper carrying out of this scheme.

With the same object in view, namely, the spread of rural industrial education by means of the national schools, the Ministry of Imperial Domains, having obtained the necessary Imperial sanction, which was accorded in the year 1890, united with the Ministry of Public Worship in recommending the introduction of the study of rural industry into the training schools for teachers under its administration. At the present moment this subject is included in the program of two establishments in the Grodnensk and Moghilevsk governments, where 170 pupils are being taught. At the same time instruction in rural industry in general, or in certain particular branches, has been introduced into the pedagogical seminaries of the Ministry of Public Instruction. Up to the present date it has been introduced into the program of 6 seminaries and 4 national schools in different governments. Money subsidies from the Ministry of Imperial Domains in aid of furthering instruction in the different branches of rural industry in all these church and secular schools have been granted to the amount of 5,000 roubles, and 1,000 pupils are now learning these special subjects in these establishments.

#### RURAL INDUSTRIAL MUSEUMS, EXPERIMENTAL STATIONS AND FIELDS.

In addition to the above-mentioned educational establishments in Russia, others have been founded with the object of spreading and developing a knowledge of the different branches of rural industry. Among such may be reckoned the rural industrial museums, and stations and grounds for the experimental study of the rural industries. The first and chief place among the former is occupied by the Imperial Rural Industrial Museum at St. Petersburg. It was founded in 1859, but it was not till 1881, when it was transferred to buildings specially constructed for it, that it became a permanent institution. The object of the museum is twofold: on the one hand, it is intended to acquaint visitors, by means of its collections, with all the latest improvements in the various

branches of rural industry, and on the other hand, popular lectures are given every year on these and cognate subjects accompanied by illustrations and practical experiments of the different apparatus and machines with which the museum galleries are enriched.

The exhibits in the museum have during the ten years of its existence been increased fourfold, and are now made up of more than 18,000 objects. A special fish breeding division has been opened in the museum for the sake of acquainting visitors with the artificial breeding of fish, and in 1892 another special department for village household industries was opened. The object of the department is to make the public well acquainted with the products of village household, and to familiarize the workers (*kustars*) themselves with all the improved modes of production and thus to further the gradual development of their industry.

The average number of visitors for the year may be reckoned at 12,000. The administration of the museum consists of a director and two sub-directors. A sum of 30,000 roubles per annum is assigned to cover the expenses and to purchase new exhibits for the museum.

Besides the museum at St. Petersburg, there are smaller museums of rural industry in some of the provincial towns, as for example, in Nizhni-Novgorod, Pskov, Poltava, Warsaw, Ufa, Tobolsk, and other places. Two of these, the Ufa and Tobolsk museums, are under the immediate administration of the Ministry; special statutes have been drawn up for them, and copies of all works issued by the Ministry are supplied them.

With reference to stations for the experimental study of rural industry, it must be confessed that up to the present there are very few in Russia that will admit of comparison with those in Western Europe. From their position as higher establishments for the practical study of the rural industries, the Petrovsk Academy, as well as the seven Middle and Garden Industrial Schools, are required, among other things, to make meteorological observations and practical investigations in all that relates to garden culture, wine manufacture, and rural industries in general. A few stations have also been established by the Government for the study and investigation of particular branches and certain specialties of rural industry. Some experimental fields, and control stations for seed sowing have also been opened. These stations have for the most part been founded in different places by local rural societies, and have chiefly for their object the trial by practical experiments of different modes of working the land, sowing seed, getting in the crops, feeding cattle and manuring the soil.

Of the stations devoted to some distinct specialty and founded by the Government, may be mentioned the following:

The Tiflis Silkworm Rearing Station, which was founded at Tiflis in the year 1887. The direct practical aim of this station is to familiarize the people with a rational process of silkworm breeding and to supply silkworm breeders with healthy crysalides, the most natural and most effective remedy against muscardine, or silkworm rot. It began its operations in 1887 by making experiments in feeding and raising silkworms in a temporary building constructed for that purpose in the Botanical Gardens at Tiflis. Microscopic investigations of crysalides were further made by specialists invited over for that purpose. At the present time there are two departments connected with this station: one in the Noukhinsk and the second in the Shoushinsk district. A sum of 24,478 roubles is yearly assigned to these two departments. In order to spread among the inhabitants of the Transcaucasian districts a sound and accurate

knowledge of all matter relating to silkworm rearing, theoretico-practical courses have been opened at the Tiflis station for teachers in village schools and for pupils of the first class in the Alexander Pedagogical Institute at Tiflis.

The Kharkov Bacteriological Station was established in the year 1887 for investigating the question of the prophylactic inoculation of cattle, as a remedy and preservative against the Siberian plague and other infectious diseases. A sum of 5,000 roubles is granted yearly towards the maintenance of this station.

The Chemical Station for Rural Industries, attached to the Forest Corps, is chiefly devoted to investigations concerning the nature and properties of different soils.

The Caucasian Experimental Station, in the Koutais government, has for its main object the cultivation of American vines and their acclimatization in Russia.

The Government Cotton Plantations, one in Tashkend, in the Syr-Dariensk district, and another in the Tiflis government, on the Government estate at Karayask, are showing excellent results.

There are, moreover, two rural industrial stations under the Administration of the Imperial Free Economic Society: one, for investigations, in the Orlovsk government in the village of Bogodoukhov, on the estate of Count Tolstoy; the other, experimental, in the Petersburg government, in the village of Zapolie, on the estate of Mr. Bildering. Also should be mentioned the three establishments under the Administration of the Ministry of Public Instruction: the Chemical Experimental Station for Rural Industries, attached to the Polytechnic School at Riga; the Agronomical Laboratory, attached to the University at Kiev; and the Technical Laboratory, attached to the Kiev Department of the Imperial Russian Technical Society.

Among the farms and grounds established by Country Councils and by local societies for promoting the experimental study of rural industries, some have been either opened on Government lands, of which a free grant had been made for that purpose, or else receive a money subvention from the Government. Such are the three experimental farms, founded by the Zemstvos of the Perm government, and the Kharkov, Poltava and Kiev experimental grounds, as well as those established by the Viatka Country Council, the Odessa experimental station, and the experimental ground under the Administration of the Imperial Society for the furtherance of rural industries in southern Russia. There are others which receive no Government subsidy, such as the seven control stations for seed sowing in the Botanical Gardens at St. Petersburg, in Helsingfors, Kiev, Yuriev, Riga, Tver and Warsaw.

## CHAPTER XIV.

## Industrial Rural Credit.

Long-termed land credit; mortgages on real estate; short-termed rural credit; credit on produce; ameliorative credit, or peasant help-funds.

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**I**N view of the enormous importance which the rural industries have in the economical organization of Russia, it is easy to understand that from a very early period the necessity of obtaining credit on landed property must have been felt.

Land credit establishments date in Russia from the reign of the Empress Elisabeth Petrovna. By a decree dated May 13, 1754, it was ordered that two banks for the nobility should be founded on Government capital, one in St. Petersburg and the other in Moscow, for granting loans for one year at 6 per cent on immovable estates and on villages, and with the right of further prolonging the term for two years. But from the very first, the loans were liquidated with great irregularity. And as the sale of the estates did not correspond with the object of the Government, which was to support and protect the nobility, from the year 1761 these short terms were replaced by longer terms, and unredeemed estates passed under the Administration of the Government till such time as the debts under which they lay should be discharged.

The reign of Catherine the Second, so rich in events and in reforms, has left its deep traces in the domain of land credit, as in many other spheres of the economical life of the nation. The fundamental points of the laws regulating loan advances on land continued in force up to the time of the emancipation of the serfs.

In 1786 the St. Petersburg Bank for the nobility was reorganized into the Imperial Loan Bank. The reasons for founding this new bank were declared in the Imperial decree to be the scarcity of money, the high rate of interest charged on private loans, and the necessity of protecting trade and especially agriculture, "so that each landed proprietor may be in a position to keep his estates, to improve them, and to lay the foundation of a perpetual income for his family and descendants".

The Imperial Loan Bank advanced loans to nobles on their lands to the amount of 40 roubles for each soul entered on the census list, at 8 per cent, 5 per cent being reckoned for the interest and 3 per cent for the liquidation, for a term of 20 years. In case of the term lapsing and the non-liquidation of the loan during a period of ten days grace, a prolongation of the term for three months was granted, with recovery of a penalty of 1 per cent a month, when, if the loan was not discharged, the estate was put in ward until the whole debt should be liquidated.

In course of time, the Savings Banks and Charitable Boards, which were first

established by the Empress Catherine the Second, began equally with the Loan Bank, to advance loans on land on the same conditions. The Savings Banks little by little became the principal mortgaging establishments. In 1859, the amount of land debts was reckoned to be 425,500,000 roubles, of which sum 79·9 per cent fell to the lot of the Savings Banks, and 12·5 per cent to the Charitable Boards, and only 7·6 per cent to the Imperial Loan Bank.

On October 15, 1802, in reply to a petition from the Estonian nobility that a special loan bank might be established in their government, which should make advances at a low rate of interest, permission was given to open the Estonian Provincial Loan Bank for the Nobility. At the same time the Treasury was authorized to advance on credit to the account of the Estonian nobility the sum of 500,000 roubles, that the bank might commence operations. The bank was further authorized for the future, as circumstances might require and the credit of the bank might justify, to advance to the nobility of Estonia, under the collective guaranty of the immovable estates of all the nobles, the sum of 2,000,000 roubles, at 5 per cent, which loan was to be discharged within a period of 35 years from the day on which the loan was made.

At the same time as the Estonian bank, there was established in Livonia a Land Loan Society for the Nobility.

In the year 1825 was founded in the governments on the Vistula a Provincial Loan Society, which still carries on its operations in accordance with statutes that were drawn up and ratified July 9, 1888.

In 1841, at the initiative of the nobility of the Nizhni-Novgorod government, there was established in Nizhni-Novgorod a bank for the nobility of that government, under the name of the Alexandrovsk Bank. The funded capital of the bank was formed out of subscriptions on the part of the nobles of the government, a tax on the income of the landholders levied in proportion to the number of serfs they possessed, and for 12 years, at the rate 14<sup>2</sup>/7 kopecks per head, and from other sources supplied by the nobility. By its statutes, the operations of the bank were limited to making advances exclusively to nobles of the Nizhni-Novgorod government, and chiefly to those who had sparsely populated estates, provided there were not less than five souls returned on the census, in sums amounting to 60 roubles per head, for periods of 26 and 37 years, and also for shorter terms, that is to say, from one to three years, with the right of prolonging the term to eight years. In 1858 the terms were fixed at 28 and 33 years, in the former case, at 4 per cent interest and 2 per cent for liquidation, in the latter case at 4 per cent interest and 1·5 per cent for liquidation, and in both cases 1 per cent premium, to be paid once for all when contracting the loan. In 1862, the Alexandrovsk Bank was authorized to advance loans on uninhabited lands in the government, on the same conditions and in accordance with the same rules as those observed by the Charitable Boards. Subsequently the character of operations effected by the bank changed completely. Thus, in 1868, the founded capital of the bank, formed of subscriptions on the part of the nobles of the government and the interest accruing on them, amounted to 1,000,000 roubles, and the reserve capital to 142,775 roubles, and the bank was authorized to advance loans not only on land or buildings belonging to the town, but on all papers bearing interest. In 1876, its operations were further extended to the purchase and sale of papers bearing interest, and it was also allowed to receive deposits, terminable or interminable. Owing to the high interest paid on deposits, their number

became very considerable, and the bank was in a position to extend greatly its operations in advancing loans on land or on immovable property belonging to the town. Inasmuch as the bank effected its principal operations on short-termed deposits, and placed them out on advances extending over long periods, it was only natural that, should any great run be made on the bank deposits, it would have extreme difficulty in meeting the demands made upon it. This is exactly what happened in the year 1891, and the bank must have suspended payments, if it had not received help from the Government, which took upon itself to satisfy the claims of the depositors, and undertook the management of the bank by drawing up temporary rules for its administration, these rules to remain in force only till the bank should be completely reorganized and set on a firm and lasting footing.

The political events of the second half of the fifth decade of this country could not but exercise a strong influence on every branch of the social and industrial life of the Russian people. The war in the east required considerable issues of paper money. This money, owing to the then slight development of the trading and commercial activity, flowed into and completely glutted the Government loan establishments. To avoid losses, it was necessary to lower the percentage on deposits, and this led to a feverish speculation in founding loan societies. A heavy run was consequently made on the Government loan banks, whose position, owing to their peculiar organization, became each day more critical. The faultiness of their organization will be evident if it be remembered that they received money deposits to an unlimited amount, and paid on them not only the ordinary but also compound interest. They further granted all depositors the right at any moment to withdraw their deposits, whilst at the same time the Government establishments effected only long-termed loans. It was, therefore, inevitable that, being unable to place the capital entrusted to them, they should suffer considerable losses, and, in case of any great run being made upon their deposits, would not be in a position to meet the demand.

The abnormal condition of loan operations in the Government establishments, in conjunction with the coming reform in the social position of the peasantry, brought to the front the question of a radical reorganization both of the banking and the money system. The Government loan establishments had already in 1859 closed their operations, and a special commission was appointed to draw up a project for organizing provincial banks that should replace the Imperial Loan Bank, the Savings Banks, and the Charitable Boards. The commissioners at once recognized the possibility of taking as the foundation and model of their scheme the system of private, in preference to that of the Government, land banks. Basing their scheme on this system, and taking into consideration that all mortgage loan establishments in Western Europe are organized either in the shape of debenture companies or companies of capitalists, the commissioners found that agricultural companies, with the reciprocal guaranty of the borrowers, would be more advantageous than joint-stock companies, to persons needing credit. In May, 1864, the Government gave its sanction to the statutes of the Provincial Kherson Bank, the operations of which were restricted to the single government of Kherson, and two years later was established the Mutual Land Loan Company. The leading features of the organization of this company, which has played such an important part in the history of Russian mortgage credit, according to the revised statutes of 1881, may be summed up as follows:

1. The Company is founded on the principle of reciprocity.

2. Its operations are guaranteed by: a reserve capital formed out of the profits; a joint capital, formed out of deposits paid in by borrowers, at the rate of 5 per cent on each long-termed loan effected by them; the reciprocal guaranty of all the borrowers; and a subsidiary capital of 5,000,000 roubles advanced by the Government, on the company undertaking to increase this capital by putting into it annually 4 per cent of all its profits.

3. The company advances loans in 5 per cent metallic mortgage bonds.

4. Long-termed loans are advanced to the amount of 40 per cent of the value of the estate, with an additional 10 per cent of its value for short-termed loans; or single long-termed loans are advanced to an amount not exceeding 50 per cent of the whole value of the estate.

5. Long-termed loans are advanced for 56 years, on condition that each six months there be paid on them  $2\frac{1}{2}$  per cent interest,  $\frac{5}{16}$  per cent for liquidation, and not more than  $\frac{1}{2}$  per cent in favour of the company.

6. The net profits of the company, after making a discount of 10 per cent in favour of the reserve capital are to go to the profit of all the borrowers, among whom it is to be divided in proportion to the share each has in the joint capital.

The Kherson Provincial Bank was founded on the same principle of reciprocity, but its statutes essentially differed from those of the Mutual Land Loan Company in following points: The bank issued mortgage bonds bearing the yearly interest of  $5\frac{1}{2}$  per cent; loans were advanced for long terms, for 34 years and 11 months; and the good faith of the bank was secured by the reciprocal guaranty of the borrowers and the reserve capital. In 1867 the Kherson Bank extended its operations to the three adjoining governments, the Ekaterinoslav, the Taurid, and the Bessarabian.

Subsequently the Mutual Land Loan Company began issuing 5 per cent debenture bonds paper value, and the Kherson Bank has stopped issuing  $5\frac{1}{2}$  per cent bonds, and now advances loans only on 5 per cent bonds.

The principle of reciprocity in land loan establishments has not up to the present attained its full legitimate development. The operations of the Mutual Land Loan Company have not adequately met the demands of credit. From the moment provincial establishments first began their operations, the question of land loans has been a special object of their attention. Attempts have been made to found provincial banks giving long-termed credit, but all such attempts have been without any real practical result. A little has been done on private initiative, as also in the establishment of joint-stock loan banks.

In May, 1871, the first Russian joint-stock bank, the Kharkov Bank, was founded, and later the statutes of the Poltava and Tula land banks were officially ratified. In 1872 were issued temporary rules for the foundation of joint-stock land banks, and at the same time, as a general principle, it was decreed that in one and the same government not more than two banks, besides the Mutual Land Loan Company, should be allowed to open operations.

Seven more joint-stock land banks, all based on these rules, were opened in the course of the year 1872: the Kiev, the Nizhegorodsk-Samara, the Moscow, the Yaroslav-Kostromsk, the Vilna, the Bessarabo-Tavrichesk, and the Don banks, and in 1873 the Saratov-Simbirsk, which had been in liquidation from the year 1886. Besides these,

the Tiflis Land Bank for the Nobility was established in 1874, and in 1875 the Mikhaïlovsk Bank for the Nobility was opened in Koutaïs.

The joint-stock banks are authorized by their statutes to advance both long-termed and short-termed loans, for varying periods, up to 61 years at the rate of 60 per cent of the appraised sum. Long-termed loans are given out in mortgage bonds, and short-termed loans in bare money. Besides the interest and liquidation percentage, the bank takes 1 per cent in favour of the company, the reserve capital, and the shareholders dividend. The operations of the land banks are guaranteed by the joint and reserve capitals which should never be less than 10 per cent of the whole sum of bonds in circulation. The sphere of its activity is defined at the time of the establishment of the bank, but the sphere has been subsequently enlarged in favour of certain banks. All the joint-stock banks for the first seven years effected loans at 6 per cent in mortgage bonds, but, notwithstanding this high interest, the exchange value of the bonds was so low, that borrowers incurred a serious loss of not less than 15 per cent, and sometimes as much as 20 per cent, or even more, in realizing them. In the year 1878, some banks began issuing 5 per cent bonds, a step which within the last two years all the other banks have followed up by completely stopping the issue of 6 per cent bonds, and converting the sum of all such bonds as are in circulation.

The all but simultaneous establishment of a large number of land banks and loan societies hindered the sale in the provinces of the mortgage bonds issued by them, whilst foreign capitalists, in their turn, showed but little confidence in such papers, partly because they were a new issue, and partly because they were issued at credit value. In consequence of this the Central Bank of Russian Land Credit was established in 1873. Its principal object was to buy up the mortgage bonds of Russian land banks and town loan companies on account of the sum which would be made by realizing abroad its own mortgage bonds issued at metallic value. The heavy fall which ensued in Russian paper money upset all the calculations of the Central Bank; the percentage received on the bonds which it bought up at credit value proved to be insufficient to cover the percentage on their own mortgage bonds at metallic value. Incurring thus only losses the Central Bank has from the year 1878 stopped issuing mortgage bonds. On January 1, 1893, there still remained in circulation Central Bank mortgage bonds at 5 per cent to the value of more than 31,000,000 roubles, and bonds at 5½ per cent to the value of about 7,000,000, in all, 38,000,000 roubles. In consequence of the fall in the exchange value of the rouble, the position of loan holders of the Mutual Land Loan Company, which advanced its loans in gold value, became irksome and precarious.

These untoward circumstances compelled the Mutual Loan Company to suspend its operations, and in the year 1890, in accordance with a petition agreed to at a general meeting of its members, it became incorporated with the Imperial Land Bank for the Nobility, of which mention will be made later, and formed a Special Department of that bank.

The heavy fall in the price of grain which lasted from 1880 to 1890 reduced the proprietors of mortgaged estates to an almost hopeless condition, their incomes being considerably diminished, whilst their payments to the loan establishments and their outlay in general remained the same as before, the interest and liquidation percentage amounting to from 7 to 10 per cent of the loan. All this, coupled with the constantly increasing transference of estates from the nobility, the original landed proprietors, into the hands

of persons belonging to other classes of society, could not but occupy the serious attention of the Government. Consequently, in the year 1885, the Imperial Land Bank for the Nobility was established, mainly for the relief of proprietors of large and middle-sized estates. Loans are advanced by this bank exclusively to nobles, for periods of from 11 to 66½ years. The loans are not allowed to exceed 60 per cent of the estimated value of the mortgaged estate. No loan can be effected on an estate whose estimated value is less than 1,000 roubles. Loans are effected by the issue of 5 per cent mortgage bonds, which are realized by the bank, but which can be given out direct to the borrower. The mortgage bonds of the Imperial Land Bank for the Nobility are guaranteed both by the estates mortgaged to the bank and by all resources at the disposal of the Government. On loans advanced by the bank borrowers are obliged to pay each six months during the whole term of the loan: a. 2½ per cent interest; b. liquidation percentage on loans for 48 years ¼ per cent, and on loans for 36 years ½ per cent; and, c. in favour of the bank and reserve capital ½ per cent. Besides this, borrowers pay once for all, at the time when the loan is concluded, ¼ per cent on the sum received. All these payments are discounted from the nominal sum of the loan. Within a very recent period, the interest on loans advanced by the Bank for the Nobility has been lowered to 4 per cent a year or 2 per cent every six months.

Somewhat earlier than the Imperial Land Bank for the Nobility, in the year 1883, was established the Land Bank for the Peasantry, the principal aim of which is to facilitate the purchase of land by peasants by means of voluntary agreement between proprietor and purchaser. The most practical way of facilitating the purchase of land is to advance the required sum for a long period to the intending purchaser and to allow the gradual liquidation of the loan. The credit thus given for the sake of promoting peasant proprietorship is limited in relation to each separate borrower, and this limit is defined by the amount of the highest loan he is able to conclude, namely: 125 roubles to any individual member of the commune and 150 roubles to a householder. The first of these two limits in the sum of a loan advanced is applied to those places where the custom of commune possession of land widely prevails; the second is applied to places where the inventory system prevails. By restricting credit within the above-mentioned limits, it is designed to promote such purchases of land, together with the cooperative help of the bank, as by their extent, correspond with the average number of working hands in a peasants family, do not necessitate the employment of hired labour, and at the same time prove more or less adequate for the successful maintenance and management of a household of the ordinary peasant type.

In all technical points, the Bank for the Peasantry carries on its operations on the ordinary bases of mortgage banks. The bank obtains the means of advancing loans by the issue of 5½ per cent mortgage bonds which are guaranteed by the estates mortgaged and by the general resources of the Government. For all loans advanced the borrower is obliged to pay every six months: a. 2¾ per cent interest; b. 1 per cent liquidation on loans for 24½ years and ½ per cent on loans for 34½ years; c. ½ per cent in favour of bank and reserve capital, in all 8½ per cent yearly on loans for 24½, and 7½ per cent on loans for 34½ years. Loans are advanced in bare money from the funds derived from the sale of the banks mortgage bonds. In the present year, 1893, the 5½ per cent mortgage bonds of the Bank for the Peasantry were converted into 4½, with a corresponding abatement of the interest paid by borrowers.

Up to 1865 the indebtedness of private landowners was reckoned at 92,000,000 roubles, of which sum 90,300,000 roubles were debts to the loan establishments of the Vistula districts (54,700,000 roubles), the Baltic districts (35,000,000 roubles), and the Kherson Provincial Bank (1,800,000 roubles). In the course of the following 28 years, the indebtedness increased to 110,000,000 roubles, and only during the last 6 years it has risen to 396,000,000 roubles, of which sum the debts to the Bank of Nobility extended to 311,000,000 roubles.

Up to 1892, in the 66 governments and districts of the Empire, including the Vistula and Baltic governments, as well as the Caucasus, in which it is reckoned there are 113,000,000 dessiatines, the property of private persons, 97,573 estates are in mortgage, covering more than 45,000,000 dessiatines, or about 40 per cent of the whole quantity of private land.

In the following table will be found the apportionment of mortgaged land among the loan establishments, its estimated value, the amount advanced, and the sum of remaining debt, for the year 1892 \*.

B a n k s .	Number of mortgage es- tates.	Number of dessiatines of mortgaged estates.	Per cent propor- tion of mort- gaged land to pri- vate land proper.	Value of mort- gaged land.	Sum of loans advanced, origi- nal, and supple- mentary.	Remaining debt January, 1892.
						R o u b l e s .
Joint Stock Banks . . .	23,054	15,017,862	13·2	582,925,000	318,830,000	303,621,000
Kherson Provincial Bank .	3,600	3,094,218	2·7	175,826,000	87,913,000	72,382,000
Imperial Land Bank for Nobility . . .	10,695	9,020,242	8·0	537,287,000	309,926,000	304,136,000
Land Bank for Peasantry . . .	8,553	1,742,330	1·6	75,098,000	60,617,000	46,395,000
Special Department of Imperial Land Bank for Nobility, formerly Mutual Land Loan Company **	7,874	6,042,428	5·4	291,136,000	178,622,000	174,584,000
Liquidated Saratov, Simbirsk Land Bank . . .	191	295,370	0·3	5,600,000	2,667,000	2,355,000
Nizhni-Novgorod Alexandrov Bank . . .	570	140,235	0·1	7,351,000	5,011,000	4,989,000
Loan Companies of Baltic Provinces . . .	32,800	5,514,968	4·9	148,760,000	79,940,000	63,028,000
Land Loan Company of Poland . . .	9,131	3,760,555	3·3	282,000,000	127,734,000	114,030,000
Caucasian Banks for Nobility . . .	1,105	433,170	0·4	10,111,000	4,782,000	3,570,000
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Total . . .	97,573	45,067,378	30·9	2,116,094,000	1,176,042,000	1,089,090,000

\* The data are taken from Statistics on Land Credit in Russia, Vol. III, Edited by the Committee of the Representatives of the Russian Real Estate Loan Associations.

\*\* The loans given in roubles gold are converted into roubles paper, reckoning 1 rouble gold = 1·5 roubles paper.

\*\*\* Besides, land loans granted by town banks are over 3,500,000 roubles; the short-termed loans of the 10 joint-stock banks, over 9,000,000; and those of the two Caucasian banks, 378,000 roubles.

It will thus be seen that of the whole sum of debts, 1,089,090,000 roubles, there are 901,062,000 roubles, or 83 per cent, owing to the loan establishments of the Empire, 114,733,000 roubles, or 10 per cent, to the loan companies of the Vistula districts, 63,028,000 roubles, or 6 per cent, to those of the Baltic Provinces, and 10,267,000 roubles, or 1 per cent, to the Caucasian banks.

The greatest quantity of land is mortgaged to joint-stock companies, and after them to the Imperial Land Bank for the Nobility and the Special Department of that bank; but as far as the amount of debts is concerned the Land Bank occupies the first place, besides which, the average estimated value per dessiatine is higher in this bank, in comparison with the others.

The proportionate quantity of mortgaged land in the 66 governments and districts for 1892 is given in the following table.

Governments and Districts.	Amount of Land.		Proportionate percentage of mortgaged land to quantity of private land.	Number of mortgaged estates.	Amount of debt, to the year 1892.
	Private (in all).	Mortgaged.			
Esthonia . . . . .	1,669,429	1,524,061	91·3	4,543	15,253,713
Livonia . . . . .	3,453,388	2,938,300	85·1	18,061	28,400,886
Ekaterinoslav . . . . .	2,784,753	1,932,999	69·4	2,408	44,967,535
Kherson . . . . .	3,335,174	2,240,430	67·3	2,983	52,046,002
Penza. . . . .	1,283,226	765,514	59·6	1,069	28,200,506
Podolsk. . . . .	1,650,280	968,800	58·7	1,352	46,596,988
Kharkov. . . . .	1,638,264	948,778	57·9	1,937	36,053,740
Courland . . . . .	1,842,249	1,052,607	57·1	10,196	19,373,314
Saratov. . . . .	2,833,183	1,559,754	55·1	1,348	42,770,656
Kiev . . . . .	1,975,995	1,057,160	53·5	1,695	49,984,592
Minsk. . . . .	4,280,227	2,273,000	53·2	1,077	20,166,901
Tambov. . . . .	2,030,228	1,081,759	53·2	1,942	47,887,035
Tula . . . . .	1,201,547	637,252	53·0	2,187	32,159,351
Kazan. . . . .	714,320	369,899	51·7	565	11,588,129
Orel . . . . .	1,518,567	784,194	51·6	2,081	36,417,917
Warsaw. . . . .	1,110,629	568,587	51·2	1,678	22,008,206
Simbirsk . . . . .	1,302,855	665,603	51·1	941	21,733,419
Kalish . . . . .	957,578	481,897	50·4	1,276	18,009,959
Poltava . . . . .	2,021,801	1,014,668	50·2	5,228	48,845,399
Bessarabia. . . . .	1,815,305	882,939	48·6	867	39,587,988
Plotsk . . . . .	884,506	422,611	47·8	1,314	13,748,836
Stavropol . . . . .	305,450	142,687	46·7	62	1,737,113
Radom . . . . .	778,472	356,535	45·8	731	9,095,222
Moghiliev. . . . .	2,204,932	982,419	44·0	1,541	13,696,031
Grodno . . . . .	1,206,957	538,244	44·6	863	12,798,660
Keltsy . . . . .	748,465	324,246	43·3	736	10,442,032
Vitebsk. . . . .	1,924,196	831,111	43·1	1,237	12,128,774
Koursk . . . . .	1,415,855	581,331	41·1	2,355	36,305,544
Petrokov . . . . .	936,236	380,038	40·6	872	10,298,556
Voronezh . . . . .	1,642,433	655,141	39·9	1,086	27,709,567

Governments and Districts.	Amount of Land.		Proportionate percentage of mortgaged to quantity of private land.	Number of mortgaged estates.	Amount of debt, to the year 1892.
	Private (in all).	Mortgaged.			
Ufa . . . . .	2,323,635	923,354	39·7	585	7,038,793
Tiflis . . . . .	1,065,885	419,838	39·4	465	2,703,265
Vilna . . . . .	1,531,373	600,111	39·1	1,278	11,837,395
Volynia . . . . .	2,722,677	1,043,127	38·2	1,290	25,208,381
Sedlets . . . . .	1,162,799	437,871	37·7	618	8,781,329
Chernigov . . . . .	1,625,257	607,520	37·4	1,346	17,811,877
Taurid . . . . .	2,624,314	974,200	37·0	657	21,821,289
Samara . . . . .	3,254,272	1,157,391	35·0	584	14,870,186
Lublin . . . . .	1,323,274	461,361	34·8	1,040	13,606,260
Orenburg . . . . .	1,284,532	430,064	33·5	149	2,536,063
Kovno . . . . .	1,593,601	533,336	33·5	2,044	16,916,688
Riazan . . . . .	1,390,544	462,970	33·2	1,607	24,702,741
Koubansk District . . . . .	429,545	141,310	32·9	319	3,104,626
Petersburg . . . . .	1,861,075	598,511	32·1	572	6,964,085
Smolensk . . . . .	2,391,050	762,919	31·9	1,738	12,025,846
Nizhni-Novgorod . . . . .	1,377,561	368,480	26·8	804	11,183,628
Kalouga. . . . .	1,057,733	270,091	25·6	668	5,717,922
Astrakhan. . . . .	376,358	96,039	25·5	10	1,030,261
Pskov. . . . .	1,832,611	459,356	25·1	1,069	7,408,096
Lomzha . . . . .	749,122	184,790	24·7	396	4,592,392
Don District . . . . .	4,321,452	1,016,589	23·5	1,791	24,057,566
Moscow. . . . .	1,055,202	238,508	22·7	493	6,813,606
Perm . . . . .	7,733,490	1,722,528	22·2	22	5,341,693
Tersk District . . . . .	691,700	143,507	20·8	128	1,208,133
Kostroma . . . . .	2,907,729	599,448	20·6	192	2,688,393
Tver . . . . .	1,829,202	350,155	19·1	975	4,857,473
Souvalki . . . . .	843,202	150,836	17·9	493	4,150,346
Novgorod . . . . .	3,847,709	554,929	14·5	815	3,559,890
Vladimir . . . . .	1,408,561	166,665	11·8	169	2,949,226
Yaroslav . . . . .	1,197,318	134,299	11·2	249	1,937,920
Erivan . . . . .	55,843	2,447	4·3	2	27,393
Bakou. . . . .	182,351	6,948	3·8	3	50,557
Viatka . . . . .	730,752	26,816	3·7	14	366,073
Koutais. . . . .	852,126	30,293	3·6	656	1,346,508
Vologda. . . . .	1,333,209	21,067	1·6	45	273,686
Elisavetpol. . . . .	513,779	6,510	1·3	9	89,752
Total . . . . .	112,947,352	45,067,378	39·9	97,573	1,089,091,208

It may be seen from this table that, of the whole quantity of private landed property, the largest percentage of mortgaged estates falls to the share of the Baltic governments, the southern and central agricultural tracts, and in part, to the districts on the Vistula; whilst the smallest, up to 20 per cent, falls to the share of the trading districts, and the northern and Caucasian governments. The distribution above made of the governments according to the percentage proportion of mortgaged estates

enables one to judge of the force and extent of the conditions which, in each of the places given, regulate and render possible the conclusion of the highest loan on land guarantee, among which conditions must be included the nature of the mortgage, the value of the estates, the actual demand for land, the state of land culture, et cetera. This is why it is only natural that the highest mortgages can be made in those places where land can fetch the best price, and where agriculture and village rural industry in general is most developed. The more valuable estates are, therefore, of course, burdened with the heaviest debts.

The loan establishments, which were in operation till 1859, by advancing loans on estates to which were attached the largest number of serfs, on the contrary, carried on extensive transactions in places where land was comparatively of little value.

If the governments be distributed according to the average loan advanced per dessiatine, beginning with the lowest and proceeding gradually to the highest, they should be grouped in the following order.

Governments.	Average sum of loan per dessiatine.	Governments.	Average sum of loan per dessiatine.	Governments.	Average sum of loan per dessiatine.		
						Roubles.	Roubles.
Lower than 10 roubns.		Pskov . . . . .	16·55	Kazan . . . . .	32·42		
Perm . . . . .	3·01	Smolensk . . . . .	16·96	Loublin . . . . .	32·83		
Kostroma . . . . .	4·85	Vladimir . . . . .	18·99	Simbirsk . . . . .	33·40		
Orenburg . . . . .	6·25	From 20 to 30 roubns.		Keltsy . . . . .	35·93		
Novgorod . . . . .	6·96	Vilna . . . . .	20·06	Plotsk . . . . .	36·22		
Bakou . . . . .	7·48	Kalouga . . . . .	22·49	Penza . . . . .	38·72		
Ufa . . . . .	8·37	Koubansk dist. . . . .	22·60	Kharkov . . . . .	39·67		
Tersk District . . . . .	8·72	Sedlets . . . . .	22·89	From 40 to 50 roubles.			
Tiflis . . . . .	8·93	Courland . . . . .	23·80	Kalish . . . . .	41·27		
Minsk . . . . .	9·07	Taurid . . . . .	23·98	Warsaw . . . . .	43·43		
From 10 to 20 roubns.		Grodno . . . . .	24·20	Voronezh . . . . .	45·00		
Esthonia . . . . .	10·96	Volynia . . . . .	25·04	Tambov . . . . .	46·56		
Astrakan . . . . .	11·30	Don District . . . . .	25·24	Orel . . . . .	47·82		
Erivan . . . . .	11·44	Ekaterinoslav . . . . .	25·44	Bessarabia . . . . .	48·30		
Petersburg . . . . .	12·14	Lomzha . . . . .	27·88	Koutaïs . . . . .	48·49		
Stavropol . . . . .	12·76	Moscow . . . . .	27·91	Kiev . . . . .	48·89		
Livonia . . . . .	12·99	Cherson . . . . .	28·07	Above 50 roubles.			
Samara . . . . .	13·34	Saratov . . . . .	28·69	Podolsk . . . . .	50·00		
Vologda . . . . .	13·84	Radom . . . . .	29·13	Poltava . . . . .	52·29		
Viatka . . . . .	14·08	From 30 to 40 roubns.		Tula . . . . .	52·87		
Moghilev . . . . .	14·45	Souvalki . . . . .	30·23	Riazan . . . . .	52·62		
Vitebsk . . . . .	15·01	Chernigov . . . . .	30·51	Koursk . . . . .	67·45		
Yaroslav . . . . .	15·22	Petrokov . . . . .	30·62				
Tver . . . . .	15·39	Nizhni-Novgorod . . . . .	30·95				
Elisavetpol . . . . .	15·93	Kovno . . . . .	32·27				

Thus, the heaviest debts lie on estates in those governments, of the southern and central black soil, where the largest floating capital is required to work and manage

them, and where the returns accruing from land culture are precarious and uncertain, as has already been explained in Chapter XI. On the contrary, those estates are burdened with the least debts, where land is of but little value, or where the returns are subject to the smallest fluctuations from year to year.

The conditions on which credit is given in establishments, advancing long-termed loans, differ and vary very widely and depend both on the interest paid and on the extent of the term for which a loan is advanced. It is, therefore, extremely difficult to make any exact calculation of the yearly payments made by borrowers, the more so as these payments are liable to fluctuate, in consequence of the conversions effected by certain banks and the frequent remortgages made by borrowers. If, however, one takes into account the terms for which loans are mostly advanced, and the payments corresponding with such terms, it may be safely concluded that the borrowers did not pay on the sums advanced during the year 1892 less than 69,720,000 roubles.

Notwithstanding the enormous sums which were placed at the disposal of the landed proprietors by the land banks after the emancipation of the serfs, only a very trifling portion of those sums were laid out in supplying the wants of the land. The same thing however, happens in other countries, where also mortgage credit has only in a few exceptional cases conduced to the relief of the agricultural industry. In Russia, as in Western Europe, loans advanced by land banks are for the most employed to facilitate the purchase of estates; to cover the heavy payments a landed proprietor has to pay to third persons when an estate is divided or portioned among the heirs; to pay off outstanding debts; to obtain the capital required for some undertaking that has nothing in common with agriculture, as business transfers, especially in cases where the discount percentage is higher than the percentage levied by land banks; or lastly, to get money for some purpose that is entirely unproductive.

Besides these debts to banks advancing long-termed loans, private agricultural industry was in a great number of cases burdened with debts to private mortgagees debts incurred when second and third mortgages were concluded with them, and, as can be easily supposed, in such circumstances the rate of interest far exceeded that paid to land loan banks. But, unfortunately, these private mortgagees do not exhaust the list of creditors preying on agriculture and landed property. A large number of landowners are further indebted on personal obligations to private individuals or to banks advancing loans for short periods. It is quite impossible to estimate the amount of debts incurred by such personal obligations.

All banks, allowing long credit, pay over loans in mortgage bonds, which they either deliver straight into the hands of the borrower or realize them at his cost; only the Imperial Bank pays out loans in cash, effecting at its own cost the realization of the bonds.

On January 1, 1893, there were in circulation mortgage bonds on land loans, issued by 20 establishments giving long-termed credit, to the value of 818,306,000 paper roubles, 92,166,000 metallic roubles, and 7,251,000 roubles in German marks, not counting the 5 per cent lottery mortgage bonds of the Bank for the Nobility, for 80,000,000 roubles; so that the bonds issued at metallic value formed 11·3 per cent of the whole amount of bonds issued at credit value. On the whole sum of paper issued at metallic and credit values, according to the increased value of the paper by reason of the interest due thereon, the following result comes out.

Rates of Interest.	818,306,000 paper roubles.	92,266,000 metallic roubles.
	Percentage ratio.	Percentage ratio.
6	0·4	—
5½	10·8	—
5	86·9	6·6
4½	1·9	92·7
4	0·0	0·7
	100	100

It may be thus seen that the ruling interest on bonds issued at credit value is 5 per cent, and at metallic value 4½, and that of the whole sum of credit paper, 29 per cent fall to the share of mortgage bonds issued by Imperial establishments, and 71 per cent to the share of those issued by private establishments. In the course of the last few years, 6 per cent of the mortgage bonds of joint-stock banks have been converted into 5 per cent bonds to the value of more than 201,000,000 roubles, and a series of conversions is now proposed by other loan establishments, private and Imperial, the latter again issuing 4 and 4½ per cent mortgage bonds. The exchange value of 5 per cent mortgage paper is now 1 and 1½ per cent above par. Consequently, borrowers in effecting new or supplementary loans are no longer placed in such unfavourable circumstances as they were when loan banks first began their operations. In realizing their paper they had then to bear losses exceeding 15 per cent of their nominal value.

During the pressure that immediately followed the emancipation of the serfs, the need of capital that could easily be turned over, induced landowners frequently to have recourse to the sale of redeemable bonds, or to loans effected in banks that gave credit for long terms. But when these resources were exhausted, and the land had in the meantime become burdened with a large amount of debts, the question how to obtain ready means, and the possibility of securing credit for a short period, became questions of life with Russian agriculturists and landed proprietors.

According to their statutes, land banks, whether joint-stock or founded on the principle of the mutual responsibility of the borrowers, could advance short-termed loans only out of their joint-stock capital, with the exception of the portion they were obliged to place out on Imperial papers bearing interest, the interest accruing from the joint-stock and reserve capitals, that portion of the profits assigned for this purpose by a general meeting of the shareholders, and the revenues derived from those estates, which not meeting with a profitable sale, had been bought in and become the property of the banks. From all this it is evident that the sources from which these loans could be made were very limited and, therefore, already in the year 1871, steps were taken by different County Councils to obtain the permission of the Government for landed proprietors to open credit account in the local branches of the Imperial Bank, a right hitherto reserved to the commercial class. Though by the statutes of the Imperial Bank, in accepting a bill of exchange on account, attention is paid solely to the solidity of the drawer and indorsees of the bill, and that the note is of commercial origin, that is to say, is founded on some genuine and actual commercial transaction, and although the Minister of Finance more than once

notified the Imperial Bank and the landed proprietors interested in the matter, that on this basis their bills of exchange could be accepted on account, still, in spite of all this, account operations on such bills of exchange could never be effected on the desired scale, inasmuch as under the actual conditions of rural industry landed proprietors who were not engaged in any regular habitual trade but occupied themselves exclusively with farming and agriculture, could with rare exceptions never present securities or obligations based on genuine and actual commercial transactions.

The necessity of a properly organized system of land credit for short periods was felt all the more keenly because, in default of mortgaging, loans concluded with private individuals came very dear, and, in case of any general failure in the crops or stagnation in the markets, landed proprietors found themselves so hampered by the temporary and unforeseen lack of ready capital that they were often obliged to make short-termed loans at a high and ruinous rate of interest.

Guided by these considerations, the Minister of Finance in 1881 appointed a committee to consider the feasibility of favouring by means of credit advances the manufacture and introduction into general use of machines suitable to develop rural industry. The committee came to the conclusion that the question submitted to them must be put on a far wider basis, and that, whilst opening up to landed proprietors sources of cheap credit, the real aim to be kept in view should rather be, not only to improve rural industry by introducing and bringing into general use better machines, but also to meet and satisfy the crying wants of agriculturists and landed proprietors by furnishing them with a ready capital that might without difficulty be rendered productive.

Basing their conclusions on this point of view, the committee recommended the advancement of loans to landed proprietors and the acceptance on account of bills of exchange on which in substitution of a mortgage deed, a second signature should be affixed, testifying that the estate was free. The proposals of the committee, with a few corrections, were accepted, and having received the imperial sanction, were incorporated into the law on single bills of exchange drawn by landed proprietors, and came into force from the year 1884. By virtue of this law, the Imperial Bank, with all its branches and departments, opened up credit to landed proprietors on single bills of exchange, that is to say, on bills having only the drawers signature for a term not exceeding nine months, on presentation of the mortgage deeds, and on seizure of the mortgaged estate to the amount of credit opened. To assist the Imperial Bank in opening and determining the amount of credit granted to any landed proprietor, or in accepting bills of exchange on account of the credit opened, the discounting committees of the Imperial Bank and its different branches and departments called in for advice and counsel from two to eight landed proprietors, who enjoyed general confidence and who were well acquainted with the actual condition of agricultural industry in their government. If by reason of default in payments on a single bill of exchange, recovery had to be sought on the estate proposed as security, in all such cases the Imperial Bank had the right of preference over all other creditors in seeking satisfaction of its claims out of the sum made by the sale of the estate.

During the nine years it has been in active force, the law sanctioning the advance of loans to landed proprietors on single bills of exchange, has not given the expected and hoped for results. Its operations have been confined within very restricted limits, and at the present moment form not more than 13,500,000 roubles of the whole sum of

credit opened, and only 9,000,000 roubles of the loans advanced. The reasons of this unsatisfactory development of operations on single bills of exchange in Russia are very numerous, but the principal one is the introduction into a matter like that of short-termed credit of a number of formalities which only serve to impede and delay the quick advance of loans in cases where they are immediately and absolutely necessary. Another reason for the slight development of operations on single bills of exchange is, that private landed proprietors are already burdened with a large number of mortgage debts; and many of them have managed to take from banks loans amounting to 75 per cent of the value of their estates. Loans in such proportion are not allowed on single bills of exchange.

In June 1892, new rules were drawn up and issued concerning operations on single bills of exchange. These rules while remaining faithful to the principles of the earlier law, are designed to facilitate landed proprietors in opening credit with the Imperial Bank, at the same time, as will be understood, requiring and insisting on all due securities for the credit granted. With this intention, they annul and rescind all superfluous and unnecessary formalities in all transactions between the Imperial Bank and its landed clients. All these measures for opening up credit on single bills of exchange, from their very nature, were designed to serve the interests of proprietors of average sized estates, and more especially to benefit large landed proprietors.

It now remains to enquire what short-timed credit is enjoyed by Russian peasant proprietors of small landed estates. The idea of rendering material support to the peasant population by means of facilitating credit operations, and thus enabling it to carry on its work in a satisfactory manner, first took its rise in Russia in the beginning of the present century. It is to a private individual that Russia is indebted for the initiation of this praiseworthy scheme. In the year 1820, Count Arakcheev founded a loan bank for advancing sums to the peasants of Grouzino, one of his patrimonial estates, and put into it 10,000 roubles to form a permanent fund capital. This bank not only advanced loans applied for by borrowers, but, even without any such application, advanced sums, by order of the elder of the community (*v o l o s t n o i s t a r s h i n a*), for the purchase of horses and cows for such peasants as had a fewer number than was in conformity with the local regulations. At the same time, the bank received deposits from the peasants. The Grouzinsk bank exists up to the present time. In this way was established in Russia, on a more or less solid foundation, the principle of opening up credit to the agricultural peasant class. The example set at Grouzino was not, however, followed for a long time.

It was only towards the end of the forties that the Appanage Department, having at its disposal a considerable capital that had in the course of many years accumulated from the surpluses of different peasant taxes and the rent accounts of peasant colonies settled on land belonging to it, determined to devote a portion of this capital to the foundation of village banks on some of its estates. These banks were empowered to advance loans to and receive deposits from peasants residing on estates belonging to the department. The interest on loans was fixed at 5 per cent. For each loan the sanction of the peasant community (*m i r s k o i s k h o d*) was required, besides which the borrower, was bound to find a surety for each 5 roubles. Besides loans on surety, loans could also be advanced on mortgage of immovable property to the amount of two-thirds of its value. For losses on loans advanced on surety, the surety was responsible; for loans on mort-

gage of immovable property, the whole peasant commune which had certified the appraisement was responsible.

From returns made for 1883 it would appear that up to that year 85 village banks with a floating capital of 1,030,000 roubles, had been opened on appanaged estates, chiefly in the northern governments. Subsequently, the Minister of Finance, whose department had up to 1866 the control of all affairs relating to Government serfs, followed the example set by the Appanage Department, and by means of a considerable capital that had in the course of many years accumulated from the same resources, founded loan establishments for these peasants.

In the year 1840, a project was drawn up for establishing peasant savings banks and peasant help funds. The object of the former was to habituate the peasants to deposit sums in a bank. The object of the latter was to advance easy loans to peasants in need. These objects being closely united, establishments of both kinds were opened together in the same volosts, or county districts. The turnover capital of the peasant help-funds was formed partly out of the capital placed at their disposal by the Ministry, and partly out of the profits on deposits made into the banks. Loans were advanced to individual householders or county communities of the districts in which the bank was located. Loans made to individual householders ranged from 1 to 60 roubles; the term over which the loan extended was limited for individual borrowers to 3 years, and for communities to 16 years; the rate of interest was fixed at 6 per cent. Up to the year 1883 there had been opened in 28 governments in all 1474 peasant help-funds, with a floating capital of 7,140,000 roubles.

During the whole time of their existence, these village banks, banks for appanaged peasants, and peasant help-funds for former Government serfs, cannot be said to have worked in a satisfactory manner. This must be attributed to the want of proper supervision, an imperfect knowledge of the peasants of business matters, the unproductive use to which loans were frequently put, the incautious advancement of money to insolvent borrowers, the non-entry of payments on loans, and the inventory of the latter for new terms.

From what has already been said, it is evident that, prior to the emancipation of the serfs, the attention of the Government was exclusively concentrated on opening up credit to small peasant householders and farmers residing on Government or appanaged lands. A few years after the emancipation, the idea arose of extending easy credit to the peasantry in general as well as to small traders and manufacturers, with the object of supporting and developing rural industry and trades. The ideas of Schultze-Delich, who was then at the height of his popularity in Germany, had penetrated into Russia and had been adopted with sympathy and zeal by the best representatives of the intelligent classes of that period. At the initiation of M. Loughinine, a landed proprietor in the Kostroma government, the first Russian loan deposit company was founded in 1865, and served as a model to all like companies that were afterwards opened.

At first and for awhile, the formation of loan deposit companies advanced very slowly, but later, owing to the active part taken in their foundation by Country Councils and private individuals who, either in the way of subscriptions or loans, contributed the sums necessary to form a fund capital, the new scheme was carried out on a constantly widening scale. Up to the end of the year 1892, the statutes of 1,494 loan deposit

companies had received the necessary official sanction. These statutes were drawn up on the following bases:

1. The floating capital of the company to be formed by means of the payments made by its members on confirmation of share, assigned upon the foundation of the company, at the rate of 50 to 200, and in exceptional cases, to 1,000 roubles.

2. The company to be empowered to effect the following operations:

a. Acceptance of deposits from the very smallest sum, 25 kopecks, to such an amount as shall not exceed five times the rate of share allotted, in accordance with the statutes of the company, to a single individual or to a single establishment.

b. Advancement of loans exclusively to members of the company, if without guaranty at the rate of 1½ of payment on share, if with guaranty, at a rate not exceeding three times the share.

c. Conclusion of loans for increasing floating capital of the company.

3. Liabilities incurred by the company on deposits or loans not to exceed 10 times the sum paid on shares and of reserve capital.

4. All liabilities incurred by obligations on the part of the company to be guaranteed by the share and reserve capitals, and by the property of members, on the basis of mutual surety; the liability of each member, both for himself and other defaulting members, to be limited to 10 times the rate of his share.

In January, 1891, there were 207,415 members of all the different loan deposit companies; whilst the financial position and operations of these 720 companies may be grouped under the following items:

Ready money . . . . .	784,000 roubles.
Papers bearing interest. . . . .	1,454,000 »
Share capital . . . . .	6,492,000 »
Reserve capital . . . . .	1,536,000 »
Loans advanced . . . . .	28,182,000 »
Loans concluded. . . . .	5,410,000 »
Deposits accepted . . . . .	3,535,000 »
Net profits . . . . .	836,000 »

Of the 1,494 companies, whose statutes have at one time or another been officially sanctioned and confirmed, there are about 840, which up to the present time are carrying on their operations, the other companies having either never been started or after a short existence suspended their operations. The very partial development of loan deposit companies, and their small number in comparison with the population, may be attributed to a large extent to the scanty knowledge and ignorance of the people, and partly to the faulty principles on which the companies based their activity. They were organized on the fundamental principles that the floating capital of the company should be formed by means of the periodical payments made by members on their shares, and that all the members should be held mutually responsible for the operations of the company. The fulfilment of the first of these conditions was, by reason of the want of means, extremely irksome to many of the peasants who were in need of easy credit, and the obligatory mutual responsibility of all the members kept a

large number of peasants from joining any of the companies. Themselves accurate and punctual in all business transactions, they were not unnaturally little disposed to become responsible for ten times the rate of their share, for defaulting members.

Of late, the question of establishing a healthier and sounder mode of affording easy credit to the peasant class has again come to the front, and a revision of the actual statutes of loan deposit companies has been commenced with the idea of enlarging their sphere of operation, and of rendering it easier for them to enjoy a large credit with the Imperial Bank, since the necessity of having recourse to private loans is excessively irksome and costly.

To remove these inconveniences, and with the purpose of ensuring to the rural population the establishment of a loan institution, which should better correspond with the organization of already existing village communities, normal statutes for village banks were in 1883 drawn up, and, at the same time, a board of control, composed of persons who were most intimately acquainted with the rural administration, was appointed to direct the affairs of the banks. It was proposed to open such banks in those places where, for one reason or another, the establishment of loan deposit companies was impracticable or impossible.

The leading principles of these normal statutes for village banks may be thus summed up:

1. The fund capital of village banks to be formed from sums granted by peasant communities or private individuals, and not to amount to less than 300 roubles.
2. Village banks to be empowered to receive deposits and to borrow loans for a sum not exceeding five times the fund capital.
3. Loans from the village banks to be advanced exclusively to peasants of those communities which founded the bank, to the amount of not more than 200 roubles per person, and for a term not exceeding one year.
4. The collection of loans not repaid by the fixed term to be effected in the same order and way as debts due to a peasant community.
5. The administration of a bank to be entrusted to a Committee of Control, consisting of three members and a chairman, and to be chosen by the village assembly of the community which founded the bank.
6. The inspection of the banks to be entrusted to the village assembly and district and Government chancelleries, to which the banks are obliged to give each year a report of their operations.

From May, 1886, when the village banks were first opened, up to November, 1889, the statutes of 184 such banks were approved and sanctioned, with a fund capital of about 500,000 roubles.

The first experiments in Russia in advancing loans on rural produce as security were made in 1839 and 1849, that is, at the time when the Kiev and Kharkov branches of the Imperial Commercial Bank were established. These branches gave out loans for terms of 3 to 9 months on grain, flax, hemp, and other rural produce, which were stored on the estates of local landowners. It was only in the Kharkov branch that loan transactions on securities in the shape of rural produce assumed any considerable development. Beginning with 341,000 roubles, the amount of loans advanced in 1846, it reached its highest sum in 1852, when loans were advanced to the amount of 2,225,000 roubles, and then again gradually declined, the sum of loans given out in 1859 not

amounting to more than 85,000 roubles. The unsuccessful results attending this most useful scheme, according to evidence collected at the time, may be explained by the want of convenient and sufficiently roomy storehouses on estates which could give any guarantee that the stored produce would be kept intact and unimpaired. On the other hand, it was all but impossible for the banks to maintain the necessary watch over the produce stored in pledge, and in this way they constantly ran the risk of never recovering the loans they had advanced. For these reasons, the Kharkov branch of the Commercial Bank and its temporary branch in the Poltava government ceased from 1859 to advance loans on rural produce, as did the Kiev branch from 1862.

Together with the construction of the network of railroads and the consequent radical changes effected in the corn trade, through the decline of the principal and largest provincial grain markets, and the transference of the leading depots of grain to the port towns, the question of the possibility of advancing loans on cereals already despatched for sale became one of great urgency and special importance. Owing to the lack in Russia, up to a very recent period, of a sufficient number of elevators and storehouses, the railroad companies in cooperation with private banks took upon themselves to supply the want. In this way, the South-Western Railroad Company opened in Odessa a special commercial agency for the sale of grain on commission, with the advancement of loans on the cargo, whether transported direct to the agency or addressed to a private firm. Up to the middle of the year 1887, these loans were made on credit of the Kiev Trading Bank, and from that time on credit of the Volga-Kama Commercial Bank, which proposed more favourable conditions to its clients, taking for all the time over which the loan extended 7 per cent, whereas the Kiev Trading Bank had taken 6 per cent for the first 14 days and 8 per cent for the remainder of the term up to the full payment of the loan.

In the year 1888 the Government deemed it advisable to come to the aid of these loan operations, and accordingly issued some temporary rules, which were supplemented in 1889, as instructions to the Imperial Bank in advancing loans on grain freightage through the agency of the railroad companies. In 1891 it was decreed that they should remain in force up to the year 1894. The stipulations enacted by these rules may be thus briefly summed up: The loans are advanced by the railway company, the amount of the loan not to exceed 60 per cent of the value of the cargo, which is to be appraised according to the prices current in the nearest trading centre. On loans concluded for any period up to 6 weeks the sum may be increased to 80 per cent of the value of the freightage. The interest on the loan is to be fixed by the Imperial Bank, and to be discounted on advancement of the loan for the whole period over which it extends, and to be reckoned by days. Besides the interest on the loan, the borrower is required to pay: firstly, a special tax, reckoned by the day over the whole term of the loan, at the rate of 2 per cent yearly, but not more than 13 per cent of the whole sum advanced, towards the formation of a reserve fund designed for granting rewards to the railway officials for administering these loan operations, and to cover any losses thereby incurred by the company; and secondly, one single payment of not more than  $\frac{1}{3}$  per cent of the whole sum of loan as indemnification for expenses on the part of the railroad company.

Loans are advanced for periods extending to six months, or without any period being fixed. In the latter case, the loan must be discharged not later than the term fixed for goods and freightage left unclaimed. The person entrusted with the placement

and disposal of the cargo has the right to inspect the goods, and to take samples of them, as well as to adopt measures for preserving the grain from damage, or to demand that such measures be taken on his account by the railway company during transport. In case of necessity, such measures of precaution may be taken on the road at the expense of the owner of the freightage, even though the latter should have given no previous instructions on the point. Railroad companies, enjoying the right to advance loans on grain cargoes, are permitted to advance loans from the cash accounts of the company, till the sum is reimbursed by the Imperial Bank; to construct or hire premises for storing freightages for a period of six months, at a charge per month not exceeding  $\frac{1}{3}$  kopeck per poud; and to maintain a special agency for the sale of grain by order of its transmitter at a commission charge not exceeding 1 per cent of the sum received for the grain. The railroad company is fully and unconditionally responsible to the Imperial Bank, for all loans advanced on account of the Bank, and reimbursed by it.

On these grounds, it was proposed to the railroad companies, which had received authority to advance loans on grain freightages to establish, not only in Russia but also abroad, commission agencies for the storage and sale of cereals by order of the transmitter. All these measures have been adopted within a period so recent that, naturally, they have not yet had time to exercise any marked influence on the general state of the grain trade. But there can be no doubt that the railroad companies by undertaking those loan and storage operations, in conjunction with the construction of railroad inside elevators, must greatly benefit both themselves and the grain proprietors. The advantages secured to the latter are the possibility of letting grain remain in the stores, receiving loans thereon, and dispensing with the costly services of middlemen, advantages that more than cover any expenses incurred by its storage in elevators at junction stations along the road, thanks to which the stored grain can be kept there till the time comes when it will be most profitable to transport it farther on, along any of the lines adjoining the junction station. On the other hand, the inside elevator tends to strengthen the connection between loan and storage operations and the railroad, for which, apart from its significance as a regulator of railway circulation, the elevator becomes important as a storehouse for grain entrusted to the line for transport or in the way of security. Lastly, the development of loan and storage operations afford the railroad company the possibility of combining for one and the same aim inside and outside elevators, in proportion as they are constructed after the American system, but, of course up to the present time without assortment and clearage of the grain.

The commission agency undertaken by the railroad companies at the same time as the loan and storage operations, also promises to be a very important and efficient measure of support to landed proprietors in their struggle with various unfavourable conditions of Russian trade and commerce. The total sum turned over by the Imperial Bank in loans advanced on grain freightages through the agency of railroads amounted in 1890 to 713,195 roubles.

The number of elevators belonging to Government and other railroads, to County Councils, towns, or private persons has rapidly increased within the last year or so. At the present moment, there are 10 with storage place for nearly 7,000,000 pouds; besides which, 45 are either being constructed or designed to be constructed, and amongst the number, three large outside elevators.

## AMELIORATIVE CREDIT.

This system of credit, in the form in which it exists in some of the countries of Western Europe, that is to say, in the shape of Government legislative measures, is up to the present time unknown in Russia. But already from the beginning of the present century there have been occasional Government measures which seem to acknowledge a consciousness of the necessity of its cooperation in the improvement of rural industry by means of a special kind of credit. Thus, in 1815, was formed the New Russian Fund for Rural Industry, amounting in all to about 500,000 roubles. The fund was designed for the advancement of loans for the sake of promoting improvements in certain branches of rural industry in the Taurid, Kherson, Ekaterinoslav and Bessarabian governments. Loans were advanced to an amount not exceeding 5,000 roubles, at 4 per cent, for a period not extending beyond 5 years.

A special fund of 60,000 roubles was also formed for advancing loans on drainage works in the Taurid government. The interest on loans was fixed at 4 per cent yearly. All expenses incurred by loans, or the valuation and inspection of the works on which they were advanced, fell on the borrowers. The loans were advanced for periods extending from 1 to 10 years. The greater part of the sums thus obtained was expended on boring artesian wells, constructing dykes, digging canals, et cetera.

Among other measures adopted for the protection and development of the rural industry, the then existing Council for the Administration of the Kingdom of Poland, in 1833, commissioned the Polish Bank to open up to landed proprietors credit for the purchase of agricultural machines and instruments, as well as of different kinds of manure. The same bank had been earlier empowered to give credit to landed proprietors for the purchase of cattle.

On loans for machines the bank took at first 6 per cent, but later, at the end of the year 1879, it was decided to take 6½ per cent a year, with the purpose of covering certain deficits in the postal and other departments, in addition to a commission fee, paid once for all, of ½ per cent. The loan operations on agricultural machines did not fail to influence the development of agriculture in the country. Up to the year 1878, that is during 45 years, loans for the purchase of agricultural instruments had been advanced to the amount of 5,000,000 roubles, which gives a yearly average of more than 100,000 roubles.

The question of extending the system of advancing loans for the purchase of agricultural machines and instruments to all parts of the Empire was raised in 1881, but a committee, appointed by the Ministries of Imperial Domains and Finance to consider the proposed extension, reported that it would be inconvenient to adopt in all parts of the Empire the order of operations practised by the Polish Bank. Their decision was chiefly based on the fact that the mortgage system does not exist in Russia, and that the presentation each time of a mortgage deed for the receipt of at times an extremely small sum would be irksome to the mortgagee, and would cost too much in comparison with the amount of the loan. As has already been explained, the introduction of the system of credit on single bills of exchange was the result of the conclusions arrived at by the committee.

For the execution of drainage works on private estates in conjunction with drainage works that were then being carried out on some Government estates by the Ministry

of Imperial Domains, special rules were drawn up and issued in 1882 by virtue of which the Ministry took upon itself the execution of such works on condition that the proprietor bear his share in the necessary outlay.

Ameliorative loans were also given out by some of the government and district County Councils, the period for the liquidation of such loans seldom exceeding three years. In one kind of credit, namely, for the purchase and distribution of the best seeds, loans might be discharged and the interest paid in natural products, but in all other cases in cash. The interest on the different kinds of loans varied from 3 to 6 per cent, and even sometimes was as high as 8 per cent; but there were also cases in which loans were advanced without any interest being taken. The loans advanced to separate individuals or to peasant householders were for the most part trifling, seldom exceeding 25 roubles; loans of from 50 to 75 roubles were more rarely advanced to a family, or sometimes to a village community, or peasant workmen's association (*artel*). As to the measures adopted to ensure accurate payment, it was generally found sufficient that the borrower enjoyed a good reputation and was known to the county board of landlords; sometimes it was required that he should be backed by two or three reliable sureties. In the case of loans advanced to peasants, besides two sureties residing in the same village as the borrower, the guaranty of the village community or of the district administration was sometimes required. The loans were mostly given in natural products from the stores of seed, and agricultural instruments constructed by and belonging to the County Councils, and only loans for building or for purchasing cattle was given in cash. A special fund formed from the yearly or occasional deductions from the rent roll of the County Councils was set apart for effecting these ameliorative loans.

The short sketch just given of measures adopted by the Government and County Councils for the purpose of giving credit for the promotion of various improvements in rural industry sufficiently proves that, owing to the extremely limited sphere of their operation, these measures are altogether inadequate to the necessities and requirements of that agricultural trade which plays so important a part in the industries of Russia. In the meantime, the want of credit to effect the most elementary improvements is felt more and more keenly. For this reason, a committee was formed in 1891 at the initiation of the Ministry of Imperial Domains to consider on what conditions a system of easy credit might be applied to the development and improvement of agriculture throughout the Empire, and to draw up rules and statutes for its application. The committee has already brought its labours to an end, and its proposals will very shortly be submitted to the consideration of the higher legislative council, and, it is to be hoped, will before long receive official sanction and be put into force.

## CHAPTER XV.

**Forestry.**

The various trees of Russian forests; the distribution of forests over European Russia and the Caucasus; the relation of the Government to forest lands; the lumber industry and trade; distribution of peat bogs and their exploitation.

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## THE VARIOUS TREES OF RUSSIA.

WITH a very few exceptions, Russian forests are not the result of artificial sowing or planting, like the majority of those in Germany, but are the natural product of the forces of nature, only slightly aided by man. Hence a Russian forest rarely consists of any single species of tree, and still more rarely of trees of one and the same age; but for the greater part presents a mixture of various species and ages. The variegated aspect of the woodlands is further intensified by the fact that even in central and southern Russia the continuous method of cutting down trees was only introduced twenty-five years ago, while previously the selected method was almost universally employed and is now exclusively practised in the vast forests of the north.

The Russian forests of the north are composed of very few species; but their number considerably increases as the forests approach the lower latitudes, so that in the south a very great variety of trees and bushes are met with. But in an article upon forestry and not botany, it is necessary to exclude bushes, as only a very few of them have a certain, and that always limited, significance in forestry.

Among the trees composing a Russian woodland only very few species are of importance; such are the pine, fir, oak, birch, trembling poplar and linden; these are the predominating species over considerable areas. Although certain other varieties are of a prominent character, yet owing to the climatic conditions of Russia they have only an inconsiderable geographical distribution; such are the beech, elm, silver fir, larch and Siberian cedar. Other species are only sparsely met with and only predominate over small areas or in localities having an exceptional soil, only suitable for a given species as for example, the black alder marshes in the lower portions of certain river valleys. Beyond such exclusive circumstances the subordinate species, such as the maple, ash and various species of elm, although widely distributed, rarely prevail over a given area even of several dessiatines.

In view of the different industrial importance of the various species, the geographical limits of their distribution in European Russia will only be considered for such

species as are spread over considerable areas, with the exclusion of those even rare and expensive woods, which are incapable of prevailing in forests. So also no mention will be made of certain species, which although predominating in woodlands and forming excellent plantations are situated in localities which are yet inaccessible to the forest industry, as for instance, the Caucasian silver fir, *abies Nordmanniana*, which forms excellent groves in the Caucasus, almost incomparable for the beauty of the trees and their gigantic size and age.

Among the fir species of Russia, the most widely distributed and important is the common pine, *pinus sylvestris*, which occurs in more or less continuous areas over at least two-thirds of the whole area of European Russia. The northern limiting boundary of the occurrence of pine is to the west, that is, in Lapland, almost 70° north latitude, and as far as 60° it forms the predominating species; while to the east, namely, towards Pechora, the pine hardly traverses 66·5° north latitude, and here it cedes to the fir and larch in its distribution. In respect to its southern boundary it is necessary to distinguish between the continuous and isolated plantations.

The southern border line of the continuous distribution of pine passes through the centre of Volyn, along the north of the government of Kiev and through the centre of the Chernigov government, intersects that of Orel to the west and that of Kaluga to the east, diverges almost entirely from the government of Tula, where the pine only grows in the west and extreme north; thence this line passes along the southern portion of the government of Moscow and north of the governments of Riazan and Tambov; further, to the south of the government of Nizhni-Novgorod whence it descends southward to the government of Penza and even to the northern part of that of Saratov, chiefly along the river Soura and its tributaries; thence the southern boundary passes through the most northern portion of the government of Simbirsk, and the southern portion of the government of Kazan, intersecting the Volga near Tetushi; and lastly, it passes along the centre of the government of Ufa to the Urals where it again diverges to the north. To the south of this boundary line, the pine only grows in isolated groves, chiefly along the river valleys on tertiary or post-tertiary sands.

The southern boundary of this isolated distribution of pine, passes through southern Volyn, descends to the government of Kiev along the Dnieper, to the south to the junction of the Tiasmin, that is, to the border of the government of Kherson; whence, after skipping over the steppe land along the river Orel, it extends along the river Samara to the government of Ekaterinoslav, where probably the pine was formerly far more common, and perhaps passed into the Donets basin where it now forms forests from Izum to Slaviansk at least. Then after skipping over the great steppe land, forming the south-eastern government of Kharkov and the southern portion of the government of Voronezh, the pine appears in some localities along the rivers Voronezh and Bitug, and also along the river Khoper, near Novokhopersk, along which it extends in inconsiderable areas to the government of Saratov, near Balashov. Thence the boundary line reaches towards the north-east to the Samara bend of the Volga, where it traverses the Volga; further along the Samara, it forms the well known Bouzouloutsk forest; and lastly in the valley of the Ural, the most southern locality of its occurrence in European Russia is between the rivers Ilek and Sakmara. Between these two boundary lines, the pine only occurs in isolated plantations, as for instance, in the governments of Poltava, Kharkov, Voronezh and Tambov. Then the pine, which is not met with in the steppe

region, again appears in the Crimea, although in small quantities and together with the local pine, *pinus laricio pallasiana*, and in the Caucasus. In the northern half of European Russia, starting from the governments of the Vistula, to the Ural mountains, it almost everywhere forms the predominating species.

The most remarkable of the other species of pine, *pinus*, is the so-called Siberian cedar, *pinus cembra*, which only grows in the north-east of Russia, chiefly along the upper Pechora and its tributaries; to the west it does not apparently overstep the Timansk mountains, and the statement of its occurrence on the banks of the Vaga is probably erroneous. To the north it extends to 64° north latitude, and to the south, along the Urals to the northern portion of the government of Orenburg. The forests of Siberian cedar are chiefly found in the eastern portion of the government of Vologda, and in the northern portion of that of Perm.

After the pine, the spruce, *abies* or *picea excelsa*, is the most widely distributed in the northern half of European Russia. In the north of Finland and Kola peninsula it cedes to the pine, and does not extend beyond 68° 75' north latitude; while to the east, where it grows as a variety of the Siberian cedar, *abies* or *picea obovata*, it on the contrary extends farther north than the pine, to 67° 5' north latitude. The southern boundary of the spruce very nearly corresponds with the northern limit of the Chernoziom region, on which it nowhere occurs. Thus its southern boundary passes over the north of the government of Volyn and Chernigov, through the west of the government of Orel, along the Oka to Elatma and up the Moksha through the north of the governments of Penza and Simbirsk, whence it intersects the Volga near the mouth of the Kama, along the right banks of which it passes up to the junction of the Bielaia and then along the latter and its tributary, the Sima, to the Urals. Moreover, in the eastern portions of Russia, starting from the junction of the Kama and the Volga, the European spruce is replaced by the above mentioned Siberian variety, *picea obovata*, the western limit of which has not yet been accurately determined. In certain parts of European Russia, for instance, in the government of Smolensk, the spruce forms the predominating species.

Among the Russian silver firs, the European variety, *abies pectinata*, is of small importance, as it only occurs in the governments of the Vistula, and only to the west of that river, where it chiefly grows in company with the beech. It also occurs as the variety, *abies leioclada*, in Transcaucasia. The Siberian silver fir, *abies sibirica* or *pichta*, is of greater importance; it grows in the north-eastern governments, extending on the south-west to the banks of the Kerzhenets in the government of Nizhni-Novgorod; to the north it extends to 64° north latitude, for instance, on the river Mezen, where it only occurs in small groves; to the west it passes over the North Dvina, and is met with as far as the banks of the Vaga. Then it grows in small clusters, apparently in a wild state, in the government of St. Petersburg on the borders of the Ladoga and Shliesselburg districts.

Like the silver fir the European variety of the larch, *larch europaea*, is only met with in the government of the Vistula, namely, only in the southern portions, where it has probably descended from the Carpathian mountains. But the Siberian larch, *larch sibirica*, like the Siberian silver fir, is distributed over the north-east of Russia, and descends together with it, towards the south-west to the banks of the Kerzhenets; but it extends farther north and west than the silver fir; to the west it reaches

the Poudozh district of the government of Olonets, and to the north it rises nearly to  $67^{\circ}$ , and in Siberia, to  $71^{\circ}$  north latitude; and to the south it descends along the Urals to the banks of the Sakmar.

The beech, *fagus sylvatica*, only grows in the south-western and southern limits of European Russia, namely, in the governments of the Vistula in the western portions of the governments of Volyn and Podolsk, in Bessarabia, the Crimea and in the Caucasus. Its northern limit corresponds pretty nearly to the isotherm of February,  $2^{\circ}$  C., so that the limit of its growth is apparently determined by the degree of winter cold. In the Crimean mountains the beech occupies the upper forest vegetation zone of from 1,500 to 4,000 feet above the level of the sea.

In European Russia only one species of oak is known, the *quercus pedunculata*, which however grows in two varieties: 1. The common or summer oak whose northern boundary of growth extends across the south-western corner of Finland to St. Petersburg, and further on in a south-westerly direction across the governments of Novgorod, Tver, Yaroslav, Kostroma and the southern part of the governments of Viatka and Perm to the Urals, which the oak does not traverse, it being quite unknown in Siberia; the southern boundary of its growth corresponds to that of forest vegetation in general, and then skipping over the steppes it reappears in the Caucasus; 2. The late Petrovsk or so-called winter oak, *quercus pedunculata*, var. *tardiflora*, forms a very remarkable variety of flowering oak, which is distinguished by its tardy leafing and by the fact that it does not cast its leaves during the winter; hence, its name of "winter oak". This tree grows, for instance, in the governments of Kiev, Poltava, Kharkov, Voronezh and also in the Crimea where apparently only this variety occurs. Its existence must without doubt be ascribed to the oft repeated statement, that two independent species of oak occur in the greater part of Russia; the *quercus pedunculata* and the *quercus robur* (*sessiliflora*). As regards the latter variety it seems to grow only in the south-western and southern limits of Russia, namely, in the region of the Vistula in the governments of Volyn, Podolsk and Bessarabia, in the Crimea and in the Caucasus. Thus its province corresponds to that of the beech. In the Ukraina it is found together with the so-called Petrovsk oak, a variety of the summer oak.

The elm, *carpinus betulus*, grows only in the south-western part of European Russia and its boundary line has a north-west to south-east direction and corresponds pretty nearly to the isotherm of March, north latitude, at  $+1^{\circ}$  C., that is to say, it passes through the most southern portion of the governments of Courland and Vitebsk, through the governments of Moghilev, Chernigov and the western portion of the government of Kharkov to the borders of the steppes. Moreover, the elm grows in the Crimea and Caucasus; it forms also considerable forests in the region of the Vistula, and in the governments of Kiev and Poltava.

The most widely distributed species of trees in Russia is the birch, which grows over the greater portion of the Empire in several varieties which often intermix, and herefore cannot be accurately distinguished in the present article. These varieties are the *betula alba* L., *betula pubescens*, Ehrh. and *betula verucasa* Ehrh. The birch grows over almost the whole of European Russia extending, to the north-west, to the Lapland coasts of the Arctic Ocean, and to the north-east, to the Pechora at  $67^{\circ}$  north latitude. Towards the south it extends up to the steppes into which it

pushes considerable distances along the river valleys, such as the Dnieper; then it reaches into the Crimean mountains, although in a very limited degree, and perhaps as a special variety, and also in the Caucasus.

The aspen poplar, *populus tremula*, occupies almost the same vast area as the birch, only to the north it falls slightly behind it, extending to 66° north latitude in the Pechora; to the south its boundary of growth also nearly corresponds to the boundary of the birch. Moreover, the poplar is found in the Crimea and Caucasus, where it generally grows together with other species of trees, and rarely forms single plantations. It generally occurs in the governments forming the transition zone between the forest and steppe land.

The linden, *tilia parvifolia*, is also very widely distributed in European Russia. Its northern boundary passes from the Gulf of Bothnia, at approximately 64° north latitude, descending slightly to the south and intersecting Lake Onega at its northern shore; it then descends further to the south and passes through the Solvyche-godsk and Oustsysolsk districts of the government of Perm to the Urals. This line corresponds approximately to the isotherm of April, at +1° C., or of August, at +15° C. To the south the linden extends to the borders of the steppes and then reappears in the Crimea and Caucasus. It forms especially large forests along the middle course of the Volga, for instance, in the governments of Kostroma and Kazan.

To better explain the comparative importance of each of these chief species, it may be observed that among the full grown timber dispatched from Crown forests in 1891, there were reckoned as follows:

Pine, . . . . .	35	per cent, of which	58	per cent were for building.
Fir . . . . .	25	"	44	"
Other firs . . . . .	1	"	38	"
Total firs . . . . .	61	"	52	"
Oak . . . . .	9	"	27	"
Birch . . . . .	10	"	6	"
Other deciduous trees .	20	"	10	"
Total " " .	39	"	13	"
Total . . . . .	100	"	37	"

Thus the firs predominate over the deciduous trees, both in the amount cut and in their fitness for building and other purposes.

### F O R E S T R Y.

It is not more than a century ago that timber began to be looked upon as a marketable article in Russia. Before then, if forests were private property they were looked upon more as pasture land, as localities for the gathering of honey and wood, than as a source of lumber, of which all who had need at that time made free use. Serfdom under which the source of revenue was considered to be obligatory labour, and the land as only the locality of the enforcement of such labour, did not help towards a healthy development of either agriculture or forestry. When the freedom of the serfs took place, the landowners who did not at once accustom themselves to the new order of things, looked upon the forests as the only means of covering their deficits and accordingly began to exterminate them. This continued until the new forms of agriculture,

based upon free labour were established. As regards the Government direction, the Crown, as the proprietor both of vast areas and of large numbers of the peasants settled thereon, also considered its chief problem to be the satisfying of the wants of the peasants for timber, which facilitated the collection of the poll tax; while the forest itself was not regarded by the Crown as a direct source of revenue. Indeed, not long before the liberation of the serfs the revenue of all the Crown forests was under a million roubles; and therefore it was only possible for a forest to be looked upon as an independent branch of industry capable of giving a considerable revenue, only if the patriarchal relations towards the peasants were altered.

Thus, although endeavours were formerly made from time to time, to introduce forest rules and regulations, yet the true basis for their realization only date from thirty years ago. At that time, however, it was learned that many of the Crown forests were greatly injured owing to the former want of care. The first undertaking of the new forest direction was to eradicate the old order of things and to found a promising and capable staff. Nothing could be done towards introducing a practical and technical forestry, without a properly organized corps of helpers.

The extreme youth of the system of Russian forestry is in itself a proof of its imperfections, for it is a matter which requires long and tried experience before it can be rightly established. The first step in this direction was the replacement of the selective system of felling for the continuous periodic system, wherever the markets permitted.

This measure, which was necessary for control, did not however attain its chief economic purpose, which was to guarantee the renewal of the forests after felling, owing to the excessive extent of the land under the forestry directions. It was at first impossible either to give out small allotments for periodic felling, or to take any measures for guaranteeing their natural renewal. A scale was made according to which, in making allotments for a period of ten years in advance, the first adjoined the sixth, the sixth adjoined the second, the seventh adjoined the third, which adjoined the eighth, and so on.

In some few localities this plan gave satisfactory results but very often the young trees were choked out by weeds against which only the quick growing species, such as the aspen, for example, were able to struggle successfully. This resulted in the transformation of many valuable fir and oak forests into less valuable aspen groves, or at least in retarding the appearance of the desired species for the very long period of ten to twenty years.

However, the great improvement which took place in the direction of forests could but reflect itself on their economical management, because for one thing, the rapid increase of the revenue from the forests, which is now as much as twenty million roubles, gave the possibility of increasing the number of foresters and their assistants, and this in turn enabled them to devote a portion of their time to technical questions instead of entirely occupying themselves as before with purely administrative duties.

At the present time the Russian foresters recognize the uselessness of the greater part of book learning, founded exclusively upon German experience and often upon conditions which do not obtain in Russia. This has given rise to the idea of the necessity of conducting and registering independent experiments for the purpose of discovering really practical measures capable of guaranteeing the best growth of the Russian

forests and the best means of renewing them. All this is still a matter of the future; but the results will not be long in favourably showing themselves, as the requisite agents are not wanting in the form of a sufficient number of foresters with a practical experience and a distinctly announced tendency on the part of the Forest Direction, to diminish the areas of the forest ranges, with a view of enabling the foresters to raise the technical level of the forest management, after preliminary administrative problems have been successfully solved.

The determination of the methods most suitable to Russia for the preliminary renewal of forest by means of progressive felling, which would then replace the continuous, periodic system; the discovery by practical experiments of the most advantageous width of the allotments for periodic felling and the order of their distribution; the introduction of intermediary fellings in the every day course of forestry; the elaboration of rules strictly based upon local conditions, and the introduction of a lucid and accurate technical book keeping, these are the chief problems of Russian forestry requiring immediate solution.

The settling of these questions lies mainly in the hands of the constant executive agents, the local foresters, but they can be greatly aided by the forest surveyors who are temporarily despatched to different localities for drawing up plans of exploitation. In Russia this working corps is called the Forest Association, while a society entitled the «Forest Rangers» is said to be organized.

The forest organizing staff includes the land surveyors, who locate the boundaries, subdivide the forest ranges into the most regular geometrical areas possible, or sections, apportion the differences observable within these fundamental figures, calculate the areas, allot the portions to be periodically felled for each year of the ensuing decade, and make plans of the forest reaches. The forest surveyor, besides guiding the survey, forms a description of the forest, investigates the natural and economical conditions of the forest farm, or dacha, as it is called, studies its former mode of exploitation, and on the basis of these data draws up a project for its future exploitation, which is then considered by a special commission in which a local element participates. The project is ultimately confirmed by the Ministry of Imperial Domains in a special committee nominated by the Department of Forests.

After the lapse of ten years, a revision of the forest organization is made, that is, a plan is formed for the exploitation for the coming ten years. This requires far less surveys and, in general, less preliminary work, but includes a revision of the exploitation during the expired ten years. The organization of the Crown forests occupies 350 forest and field surveyors, a number which is hardly sufficient for conducting the periodical revisions in the 14,225,000 dessiatines of Crown forests already organized. Therefore, the Management of the forests has before it the elaboration of such a plan as will require a less expenditure of labour than the periodical revisions now demand. The means which would be thus set free should be before all directed to a general superficial exploration of the wild forests of the north, which up to now are almost unknown, although there is reason to suppose that they have a much greater economical importance than is generally attributed to them. Such work, in the north, would require the elaboration of such methods as would satisfy the fundamental purposes of forest organization, while the labour itself would have to be done rapidly, as slow methods would not be practical in the vast northern forests.

Fifty years ago when the organization of the Crown forests was first established, the greatest energy was turned towards the work, thanks to which the Forest Association at the first period of its existence performed great service towards the establishment of a forest industry in Russia; but afterwards, when it was found desirable to revolutionize the system of management, it was necessary to devote temporarily all the remaining interests to this matter, namely, to turn to the perfection of the administration and the bettering of the staff of the forest surveyors, and in general to the reformation of the executive, so that the forest organization in consequence withdrew to the background. But now that a true forestry management has already taken root, the Association must again occupy its proper place and lead to the adoption of measures, answering to the requirements of the Russian forest management; and the basis for the elaboration of such measures, has already been given by a sufficiently prolonged experience in forest organization extending over half a century.

In general, it will be necessary for the Russian foresters to turn their serious attention to the creation of suitable practical measures. In starting the work they necessarily turned towards the West European methods; but every successful result shows more clearly how indispensable it is to base the whole structure upon home conditions and home experience. The Russian foresters have brilliantly proved their capability of doing so, in a branch of forestry which has nowhere been practised in Western Europe, namely, in the planting of forests on the steppes. Some great authorities in Natural History categorically denied the possibility of growing woodlands in the steppe regions, whose nature, they said, was contrary to all tree vegetation. However, the Russian Government, recognizing the all importance of the introduction of forests in the steppes, resolved to make the effort, and even chose the most unfavourable locality to try the experiment, that is, the elevated open steppe in the government of Ekaterinoslav. A young Russian forester, Victor Graff, was sent there for the purpose, and under the most unfavourable circumstances and trying conditions succeeded, thanks to his sound knowledge and great energy, in overcoming all obstacles and in growing a forest in that locality. He had to struggle against the variable climate of the steppes, with the great changes of temperature, with the prejudice of the inhabitants against tree planting, and numerous other obstacles; the chief practical difficulty, however, did not lie here, but in the injury which the trees suffered from the too luxuriant herbaceous vegetation of the soil.

Every energy had to be directed towards combatting the grasses and to gradually elaborate measures for that work, in choosing and planting the most propitious species of trees, in devising the best means of weeding away the grasses, and in originating the suitable manual and horse implements for the purpose. At first these works cost exorbitantly, but they subsequently became cheaper, and now their price is quite within the means of private individuals. In the place of the former desert where Graff built himself a simple hut to live in, there is now a magnificent forest, covering a continuous area of 3,000 dessiatines. Subsequently the works were extended to other localities in the region of Novorossisk, where several steppe forest lodges have been instituted, which serve as centres for the extension of constantly improving and simplified methods for the planting of trees. The total area of the steppe forests has already reached six square miles, and the Forest Management annually adds about 750 dessiatines; their example has been followed by other institutions and by private individuals. The plantation of forests is

being actively carried on particularly in the province of the Don Cossacks, and the Direction of the Appanage is systematically and energetically realizing the idea of intersecting the eastern steppes of the Volga by parallel series of bands of groves, hoping by this means to improve the local climatic conditions.

The works undertaken by the Forest Management for binding shifting sands are also distinguished for their originality. Such works have been carried out both on the seacoast, as at Vindau and Libau, and also in the interior, and chiefly near the town of Aleshka above the mouth of the Dnieper. In the latter locality the river sand had been carried over vast areas, so that a portion of the inhabitants were obliged to emigrate. The Government Management of Forests then undertook the work of combatting the sand by planting the local species of willow, the sand willow, *salix acutifolia*, which, contrary to the other species of willow, thrives equally well in shifting sands. The soil of an entire and vast region has been bound together in the course of several decades by planting this species. Moreover, two geographical square miles have been converted into forest, and the shifting of the sand was completely stopped and vast areas returned to cultivation.

These plantations were conducted on the lands of the Government peasants, and by their obligatory labour, and therefore, when the direct guardianship over the Government peasants was removed, the greater portion of the willow plantations were handed over to the entire disposition of the peasants, who forgetting the bitter lesson of the past allowed their cattle to destroy the plantations, and the sands again shifted over the country, strewed itself over the cultivated ground and again placed the question of emigration to the fore. It was again necessary to reconsider the question and to have recourse to the same remedy. Besides the Dnieper sand, the Management of Forests has also bound together a vast space of the Baltic sand hills, and has made plantations in the neighbourhood of Libau and Vindau covering almost one square mile. Similar works have also been recently begun in the Caspian Naryn sands, in the hope that forest plantations might awaken life in this desolate country.

In combatting, in some parts of the Empire, an excessive drought, the forest was in other localities obliged to make not less strenuous efforts against the excessive moisture of the soil and to drain vast marshes. For this purpose two expeditions were formed, chiefly at the expense of the Management, one to the west and the other to the north. The northern expedition conducts the drainage of separate bogs in the midst of the vast marshy areas, chiefly of the governments of Novgorod, Yaroslav, Petersburg and Pskov, for which purpose the bogs are chosen by the Management of Forests, Zemstvos and private individuals. The preliminary surveys and also the salaries of the members of the expedition are covered by the Government, while the digging of the canals is done at the expense of the proprietor of the bogs. The results are quickly realized on grassy bogs, but the deep moss bogs are more difficult to deal with. At all events the labours of the northern expedition enjoy great popularity among the local inhabitants.

The western expedition, independent on similar isolated works, has for its chief object the draining of the vast Pinsk bogs, which enter into the composition of the so-called Polessie. This includes a locality having approximately the form of a triangle at whose extremities lie the towns of Brest-Litovsk, Kiev and Moghilev. The locality which covers more than 1,500 square miles is bounded on the north-west by the ele-

vations separating it from the Central Russia borders, and on the south-west, by the last spurs of the Carpathians. The centre of this plain is occupied by the valley of the river Pripyat with its tributaries. Previous to the canalization of the Polessie it did not contain more than 25 per cent of dry habitable areas, and up to 35 per cent of marshy forests; both one and the other were scattered about in the form of islands, separated by bogs, which were only passable in winter. The remaining area of over 600 square miles was a naked bog, void of all vegetation; the decompositions going on in the bog and accompanied by the evolution of multiferous miasms, rendered the district extremely injurious to the health of man and beast, and indeed the inhabitants of Polessie have a sad reputation for their weakness and for the *plica polonica*, a purely local disease produced by the marsh exhalations.

The Government started the work of draining the Polessie in 1873, by a preliminary survey which showed that the process of the formation of the bogs was due to purely local conditions. The chief southern tributaries of the river Pripyat, which traverse this region, flow as it were along radii to a common centre and fall into the main stream near Pinsk at a very inconsiderable distance from each other; it is also into this portion of the Pripyat that its chief northern tributaries fall. These rivers which have a rapid current at their source, flow slowly between low banks when they approach the Polessian plain, and on meeting the slightest obstacle impeding their course, the water overflows its banks into the bordering lowland. These obstacles chiefly proceed from the non-uniform opening of the ice on the Pripyat and its right tributaries. When the snow begins to melt on the spurs of the Carpathians, in March, and even in February, the right arm of the Pripyat carries a mass of water, which on meeting the ice in the main stream, breaks it and overflows the banks, and due to the close proximity of the mouths of these tributaries, they flood a vast continuous area between Pinsk and Turov. The melting of the local snows still further increases the overflow of the spring freshets. On approaching Mozire the Pripyat enters into a comparatively narrow defile with high banks, forming as it were, a head of water which impedes its flow from the middle Pripyat basin, and still further increases the extent of the rising waters. The spring floods cause the waters to rise as much as two sogenes, and frequently extend over twenty versts. These freshets sometimes continue to July and then the water commences to seek its usual course, but quantities of it never find the river channel; owing to the prolonged stagnation of the muddy spring waters, they pile up a great many alluvial banks which block the mouths of many of the tributaries and thus form locked-in basins; only the upper portion of the water which falls into these basins returns to the river; the lower portions stagnate the entire summer and in the majority of cases evaporate, leaving a thick layer of slime and sand at the bottom of the basin. The constant repetition of these phenomena, year after year, has resulted in the formation of a series of oblong bogs along the river valleys.

Thus the problem of the drainage of the Polessie consisted in the formation of new outlets for the flow of water which the natural course of the tributaries of the Pripyat could not contain. It was necessary to give an outlet to the stagnant waters and to direct them to localities suffering from a scarcity of water; in a word, to establish a more regular distribution of the movement of the waters over the entire basin of the river Pripyat. A general plan was formed upon these principles for draining the Polessie by means of a network of canals, combined and constructed in such a manner as

not only to give an outlet to the waters in the basins and to give them a regular distribution, but also to gain the possibility of so directing them, as to lower the sub-soil water to the level necessary for freeing the low-lying forests from the excessive moisture of the undersoil, and to form a dry soil on the surface of the bogs sufficient for the growth of grass and other pastures, and thus prevent the further lowering of the level of the waters, and to avoid an excessive dessication of the soil.

Up to 1892, 3,312 versts of main and branch canals were constructed. The main canals are from 5 to 20 arshines wide and from 1·5 to 4·5 deep; and the branch canals are from 3 to 5 arshines wide, and from 1 to 1·5 deep. Now that the canalization has already made sufficient progress, and as its results are distinctly visible, is it possible to more accurately determine its importance in Polessie. About 25 per cent of the drained bogs are, as experiment shows, undergoing a natural forest growth, while the remaining 75 per cent are being converted into meadow land, which after the lapse of three or four years, already give a good harvest of hay.

The growth of vegetation over the drained bog land has also a favourable influence over the atmospheric conditions of the locality, for as is well known, an area covered by vegetation gives a larger amount of evaporation, than the same area covered with water, and thus aids more towards the state of moisture of the atmosphere. The canalization that has already been carried out has resulted in the drainage of 2,333,333 desiatines of land and the value of the agricultural lands and forests over this area has risen by 50,000,000 roubles while the cost of the preliminary works and actual drainage has not exceeded 3,000,000. Besides which the hygienic conditions in the drained portion of the Polessie have distinctly changed for the better; many deseases such as fevers, malarias, lung an dthroat deseases, have lost their epidemical character and the *plica polonica* has altogether disappeared. The new generation which has grown on the drained land and not in the midst of the marshy exhalations, no longer bears the typical traces of physical debility, which characterized the former generations. The short sketch of the position of the forest direction in Russia shows what vast problems await it in the near future. Although this direction is still in its infancy it has already succeeded in doing much for the country and will undoubtedly do much more under the steadfast endeavours of the Government to direct all its energies to raising the natural conditions of the welfare of the Empire.

#### THE FORESTS OF EUROPEAN RUSSIA AND THE CAUCASUS.

A considerable portion of Russia is still covered by woodland, but the figures of the extent of the forest area of Russia are usually exaggerated, chiefly owing to the fact that they include the general area of the tracts known as waste lands, which are unsuitable for cultivation, and often consist of vast bogs. So long as they are not converted into arable soil they should be excluded from the estimation of the true forest land, as well as the lakes, rivers, roads and household domains. Exact data only exist for organized Crown forests, for all other forests it is only possible to take the same proportion of the forest land to the total area of the forest range as exists in the organized forests of the same district. The following table of the forest lands of European Russia and the Caucasus is formed upon this principle. It must, however, be observed that the data it contains are only roughly approximate, as accurate figures only exist for 20 per cent of the forest area, and that the statistics for the other forest ranges, especially those belonging to private individuals, are far from being trustworthy. Hence

it was necessary in the first place to take a smaller figure in all doubtful cases, rather than a larger one, and in the second case to express the areas not in dessiatines but in far greater units, that is, in geographical square miles (5,104 $\frac{1}{2}$  dessiatines).

Table showing the area a

Governments and Regions:	Number of inhabitants, in thousands.	Total area of dry land, in geographical square miles.	The Government Forest Management.	Areas under forest.	Crown estates.
Riazan.	2,053	754	26·4	—	—
Tula.	1,610	554	7·6	—	—
Kalouga.	1,330	554	16·0	—	—
Orel.	2,255	837	53·0	0·4	—
Koursk.	2,590	832	10·0	—	—
Voronezh.	2,930	1,180	24·0	0·7	—
Tambov.	3,035	1,192	81·0	—	—
Penza.	1,705	695	43·0	3·4	—
I. Total in the Central Agricultural region.	17,508	6,538	261·0	4·5	—
Tver.	1,913	1,169	36·0	28·6	—
Moscow.	2,425	596	17·6	8·7	—
Vladimir.	1,558	874	56·0	29·2	—
Yaroslav.	1,179	637	42·0	0·6	—
II. Total in the Moscow Industrial region.	7,075	3,276	151·6	67·1	—
Nizhni-Novgorod.	1,685	918	123·0	14·2	—
Kazan.	2,379	1,141	265·0	3·5	—
Simbirsk.	1,767	886	24·5	143·0	—
III. Total in the Middle Volga region.	5,831	2,945	412·5	160·7	—
Samara.	2,826	2,703	65·0	38·0	—
Saratov.	2,581	1,512	28·0	8·8	—
IV. Total in the Lower Volga region.	5,407	4,215	93·0	46·8	—
Ufa.	2,167	2,183	63·0	9·7	—
Orenburg.	1,449	3,421	59·0	0·2	—
Perm.	3,002	5,943	1,968·0	7·6	—
Viatka.	3,230	2,740	1,250·0	8·0	—
Kostroma.	1,498	1,515	260·0	61·0	—
V. Total in the Ural region.	11,346	15,802	3,600·0	86·5	—
Vologda.	1,368	7,207	5,530·0	193·0	—
Archangel.	361	13,457	6,101·0	276·0	—
Olonets.	379	2,662	1,069·0	3·5	—
VI. Total in the extreme northern region.	2,108	23,326	12,700·0	472·5	—
Novgorod.	1,355	2,189	166·0	116·0	—
St. Petersburg.	1,827	798	41·0	13·9	—
Pskov.	1,086	791	16·4	—	—
VII. Total in the Lake region.	4,268	3,778	223·4	129·9	—
Estonia.	436	363	0·02	—	—
Lithuania.	1,364	843	25·2	—	—
Courland.	751	488	57·0	—	—
VIII. Total in the Baltic provinces.	2,551	1,694	82·2	—	—
Smolensk.	1,462	1,003	17·0	—	—
Mogilev.	1,452	860	21·4	—	—
Vitebsk.	1,426	809	34·0	—	—
Kovno.	1,707	727	30·0	—	—

To make the survey easier, Russia has been divided into 15 trants, including in each of them places of like resources and wealth, and where the forests do not present too marked differences.

### Productiveness of forests.

Other Crown districts.	Private estates.	Total area under forests.	Total of lands under forest in per cents of the total area of dry land.	The number of desiatines of forest per 1,000 inhabitants.	A desiatine of Crown forests gives yearly cubic sagenes of wood.	According to the calculation of the productiveness of these forests is in thousands of cubic sagenes.
63	89·4	11·9	222			
31	38·6	7·0	122			
90	106·0	19·1	409			
128	181·4	21·7	410			
53	63·0	7·6	124			
37	61·7	5·2	107			
79	160·0	13·4	269			
55	101·4	14·6	303			
536	801·5	12·1	233			
59	123·6	10·6	330			
126	142·3	24·0	299			
184	269·2	30·8	881			
164	206·6	32·4	893			
533	751·7	23·0	542	0,402		1,715
136	273·2	30·0	827			
58	326·5	28·6	700			
140	307·5	34·7	888			
334	907·2	30·1	794	0,355		1,643
1·6	40	144·6	5·3	260		
1·6	118	154·8	10·2	306		
158	299·4	7·1	282	0,251		382
710	782·7	35·8	1,842			
540	599·2	17·2	2,109			
917	2,892·6	48·7	4,913			
24	578	1,860·0	68·0	2,937		
	639	960·0	63·4	3,275		
24	3,384	7,094·5	44·9	3,189	0,030	1,186
25	267	6,015·0	83·5	22,424		
	6	6,383·0	47·4	90,174		
	82	1,154·5	43·4	15,536		
25	355	13,552·5	57·1	32,788	0,009	630
	335	617·0	28·2	2,321		
	248	302·9	38·0	845		
	173	189·4	23·9	890		
	756	1,109·3	29·4	903	0,153	865
	33	33·0	9·1	386		
	101	126·2	15·0	479		
	68	125·0	25·6	848		
	202	284·2	16·8	568	0,313	467
	218	235·0	23·4	817		
	243	264·4	30·7	929		
	162	196·0	24·2	704		
	85	115·0	15·8	501		

Table showing the area ar-

Governments and Regions.	Number of inhabitants, in thousands.	Total area of dry land in geographical square miles.	The Government Forest Management.	Areas under forest.
Vilno . . . . .	1,459	760	52·0	—
Minsk . . . . .	1,917	1,636	131·0	—
Grodno . . . . .	1,511	692	59·0	20·2
IX. Total in White Russia and Lithuania . . . . .	10,934	6,487	344·4	20·2
Warsaw . . . . .	1,588	258	8·7	—
Kalysh . . . . .	927	201	5·8	—
Kelets . . . . .	757	179	16·4	—
Lomzha . . . . .	675	215	24·2	—
Lublin . . . . .	1,076	299	7·9	—
Petrokovsk . . . . .	1,218	218	13·2	—
Plotsk . . . . .	658	193	6·0	—
Radom . . . . .	782	220	23·2	—
Souvalki . . . . .	707	219	37·0	—
Sedletsk . . . . .	747	254	6·8	—
X. Total in the Vistula region . . . . .	9,138	2,256	149·2	—
Volyn . . . . .	2,554	1,286	80·0	6·8
Kiev . . . . .	3,329	912	35·0	3·3
XI. Total in the forest region of Ukraina . . . . .	5,883	2,198	115·0	10·1
Bessarabia . . . . .	1,773	816	1·4	—
Podolsk . . . . .	2,768	752	16·0	3·8
Chernigov . . . . .	2,401	938	26·3	—
Poltava . . . . .	3,058	893	2·7	0·04
Kharkov . . . . .	2,578	975	11·2	0·03
XII. Total in the poorly wooded Ukraina . . . . .	12,578	4,374	57·6	3·9
Stavropol . . . . .	723	1,068	1·4	0·02
Astrakhan . . . . .	914	4,226	10·6	—
Don region . . . . .	1,852	2,868	—	—
Ekaterinoslav . . . . .	2,096	1,211	1·6	0·01
Tauride . . . . .	1,230	1,082	13·5	0·1
Kherson . . . . .	2,352	1,275	7·4	0·5
XIII. Total in the steppe region . . . . .	9,167	11,730	34·5	0·6
Baku and Dagestan region . . . . .	1,461	1,225	58·0	—
Tersk region . . . . .	762	1,232	55·0	—
Kouban region . . . . .	1,365	1,644	62·0	1·0
XIV. Total in Northern Caucasus . . . . .	3,588	4,101	165·0	1·0
Elisavetpol . . . . .	802	785	85·0	—
Zakatalsk . . . . .	82	72	—	—
Kars . . . . .	179	329	21·3	—
Koutais . . . . .	1,015	649	59·0	—
Tiflis . . . . .	864	720	95·0	0·7
Black Sea region . . . . .	25	130	80·0	—
Erivan . . . . .	734	473	13·3	—
XV. Total in Transcaucasia . . . . .	3,701	3,158	353·6	0·7
General total in European Russia and in the Caucasus, excluding Finland . . . . .	111,083	95,938	18,753	1,004·5

## productiveness of forests.

geographical square miles, in:			Total area under forests, of the total area of dry land.	The number of des-sertaines of forest per 1,000 inhabitants.	A desser-taine of Crown forest gives yearly cubic sagenes of wood.	According to this calculation the pro-ductiveness of the total area under for-ests is in thousands of cubic sagenes.
Other Crown districts.	Private estates.	Total area under forests,				
106·0	158·0	20·8	552			
257·0	388·0	23·7	1,032			
45·0	124·2	18·0	420			
1,116·0	1,480·6	22·8	696	0·185		1·397
38·0	46·7	18·1	150			
27·0	32·8	16·3	180			
33·0	49·4	27·6	333			
36·0	60·2	28·0	455			
60·0	67·9	22·7	315			
31·0	44·2	20·3	209			
25·0	31·0	16·1	240			
50·0	73·2	35·5	216			
48·0	80·0	36·5	577			
40·0	46·8	18·4	327			
383·0	532·2	23·6	297	0·288		782
250·0	336·8	26·3	673			
160·0	198·3	21·7	304			
410·0	535·1	24·4	464	0·197		538
50·0	51·4	6·3	148			
63·0	82·8	11·0	152			
55·0	81·3	8·7	173			
27·0	29·8	3·3	50			
80·0	91·2	9·4	180			
275·0	336·5	7·7	136	0·309		530
2·5	3·9	0·4				
9·4	20·0	0·5	112			
7·2	23·0	30·2	1·1	84		
9·6	11·2	0·9	27			
0·2	25·5	39·3	3·6	163		
3·7	11·6	0·9	25			
7·4	73·7	116·2	1·0	65	0·266	158
	65·0	128·0	10·0	432		
	16·0	71·0	5·8	476		
	218·0	281·0	17·0	1,050		
	299·0	475·0	11·6	675	0·090	218
	70·0	155·0	19·7	986		
	22·0	22·0	30·6	1,367		
	5·7	27·0	8·2	765		
	192·0	251·0	37·1	1,262		
	96·0	191·7	26·7	1,131		
	—	80·0	61·5	16,320		
	2·3	15·6	3·3	108		
	388·0	742·3	20·3	1,003	0·064	242
58	9,202·7	29,017·8	30·3	1,309	0·07	11,500

From the data grouped in the table it may be seen that the whole plane of forest land in Russia, including the Caucasus but excluding Finland, occupies a little more than 29,000 square miles. This enormous plane, exceeding by one and a half the surface area of France and Germany taken together, forms more than 30 per cent of the whole superficial contents of Russia. If one were to judge from these data alone, he would be forced to conclude that excepting Norway, Russia is the richest in forest land of all Western European countries. But Russia is too large a country to allow one to judge of it in this easy fashion, and, if a true conclusion is to be reached each of the tracts must be reviewed separately and in detail. It will then be seen that only two tracts can be called really woody, the extreme north, (57 per cent), and the Cisural districts (45 per cent), which form a third of European Russia. Of the rest, only two tracts, the central Volga and the Lake districts have a quantity of forest land equal to that of Austria (29 to 30 per cent); five tracts, the Moscow province, White Russia, the Vistula districts, the woody parts of the Oukraina, and Transcaucasus, occupy in this respect a middle place between Germany and France (20 to 24 per cent); one tract, the Baltic provinces, is on a level with France (17 per cent); in all the others, the proportion of forest land is less than in France, which, in general, is counted as a sparsely wooded country. In this last category must be grouped those parts of Russia which rank among the first agricultural provinces: the central agricultural district (12 per cent), the lower Volga districts (7 per cent), Northern Caucasus (12 per cent), and the sparsely wooded district of the Oukraina (8 per cent). Lastly, there is the special tract covered by the steppes where the proportion of forest land is calculated to be in all 1 per cent.

To make this still plainer, these figures may be arranged in six groups, as has accordingly been done in the annexed table.

D i s t r i c t s:	Percentage of the whole extent of Russia.	Percentage of forest land in proportion to the whole extent.
Extreme North and Cisural districts . . . . .	41	54
Central Volga and Lake districts . . . . .	7	30
Moscow trading district; White Russia with Lithuania; Vistula districts; woody parts of the Oukraina; Transcaucasus . . . . .	18	23
Baltic provinces . . . . .	2	17
Central agricultural district; lower Volga districts; sparsely wooded parts of the Oukraina; Northern Caucasus . . . . .	20	10
The steppes. . . . .	12	1

From all this it follows that less than a half of Russia is rich in forest land; one fifth is poorer than Germany or France; and one-eighth has scarcely any at all. It is also important to note that forests belonging to private persons, which are less durable, are chiefly to be found in those provinces where forests are most sparse. Thus, in the first two of the above groups, private forests form 21 per cent of the whole forest land; in the rest of Russia they constitute 60 per cent.

If recourse be had to another generally accepted measurement of the extent of a country forest land, namely, its proportionate quantity to each individual inhabitant, the result, owing to the spare population of Russia, will be more satisfactory. For each inhabitant the mean quantity is 1·3 dessiatines of forest land; whereas in Europe it is generally reckoned at 0·8, and in its different kingdoms is calculated at 11 in Norway,  $2\frac{3}{4}$  in Sweden,  $\frac{1}{2}$  in Austria,  $\frac{1}{3}$  in Germany, and  $\frac{1}{5}$  in France. It must, however, be remembered that this criterion is not so sure as the other, by reason of the increase of population in the future, and the difficulty of forest cultivation in places where there is a lack of population. But, even if this be not taken into consideration, it is not sufficient, if a true conclusion is to be reached, to be content with general figures, but each tract of Russia must be taken separately. Then, reckoning that each province uses and consumes its own forest wood, the following result will come out. Of the 111,000,000 inhabitants, 2,000,000 have more forest land than Norwegians (33 dessiatines per head); 11,000,000 more than Swedes (3 dessiatines); 34,000,000 more than Austro-Hungarians (from 0·5 to 0·9); 6,000,000 nearly as much as Austrians (0·46); 37,000,000 less than Germans (from 0·23 to 0·3); and 21,000,000 less than French (from 0·65 to 0·14). It thus appears that more than one-half of the inhabitants of Russia, even now with its spare population, have a less quantity of forest land than in Germany, and one-fifth of the population much less than in France.

The extent of forest land in Russia varies to a very high degree; in the fifteen tracts tabulated above, the extent of forest lands in different governments within one and the same tract will bear a proportion one to another of 1 to 2 and even 1 to 4. In the Transcaucasus, it varies as much as 1 to 20; but this extreme variation may perhaps be attributed to the little trustworthy information received on the forest lands of the different Caucasian provinces. If the survey be applied to districts, the variations become still sharper and more striking. Thus for example, in the Livenesk district the proportion of forest land to the whole area is 60 times less than in Briansk district of the same Orlovsk government; in the Taurid government, which is included in the steppe tract, in the Yaltinsk district there is for each inhabitant the mean quantity of 75 dessiatines of forest land, but in the Perekopsk district there are no forests at all. Even in woody places the same striking variations are observed. In the Kostroma government, in the Vetylouzhsk district the extent of woodland is 30 times greater than in the Nerekhotsk district: in the Perm government, in the Cherdynsk district it is 33 times greater than in the Shadrinsk district. It is also well known that in many districts, as in Ardatov, in the Nizhni-Novgorod government, portions of them will be covered with forests, and other portions will, on the contrary, be sparsely wooded.

A knowledge of the unsatisfactory distribution of land over a large part of Russia naturally leads to the enquiry as to what extent forest productiveness corresponds with the requirements of the country. For the better determination of the quantity of forest materials annually used in Russia, the requirements of the industries in which they are employed will first be examined, and then the household requirements of the inhabitants. The quantity of woodstuffs employed in mechanical and chemical operations does not admit of being estimated and can only be set down as, including ship building, approximately amounting to 2,000,000 cubic sogenes.

In smelting cast iron and working it into iron there was used in wood and charcoal as follows:

In 1887 . . . . .	1,927,000	cubic sagenes
» 1888 . . . . .	2,091,000	" "
» 1889 . . . . .	1,851,000	" "
» 1890 . . . . .	1,963,000	" "
Yearly average . . . . .	1,933,000	" "

More than 100,000 cubic sagenes for salt extracts are used per annum. As to the consumption of wood in other forms of mining industry, as lead, zinc, copper, silver, gold, et cetera, there is no positive data, but it may be safely concluded that not less than 2,500,000 cubic sagenes of firewood and timberwood are used a year. Of course, the use of coal in metallurgic industries has during the last few years greatly increased; but the effects of this have been felt only in the increase of iron prepared in the coal fields, and the many fields, which for a long time have used wood, still continue to do so, and do not consume any other kind of fuel.

The exchange of vegetable for mineral fuel is much more easily effected on railroads since goods can be transported for a far greater distance on an uninterrupted line. And, in fact, in 1891, on the whole chain of railway lines 600,000 cubic sagenes of wood fuel was used, in all 6 per cent more than in 1882, though during the intervening ten years the general network of railroads had increased from 21,000 versts to 27,000 versts; that is, had increased by 30 per cent, independently of the increased circulation and traffic on the previously existing lines. Of course, during the same period there was a corresponding increase in the use of mineral fuel, which in 1882 exceeded the use of wood fuel only by 12 per cent, whereas in 1891 it formed already 60 per cent of the whole quantity consumed on the railroads. Besides this, about 200,000 cubic sagenes are yearly used for sleepers, telegraph poles, and various railroad constructions, giving a total of 800,000 square sagenes. For heating the 1,500 steamboats that run along the home rivers of Russia, up to 300,000 cubic sagenes of wood are consumed, which constitutes less than a half of all the fuel used for this purpose.

The different manufactories and works use for heating their steam boilers and engines not less than 1,500,000 cubic sagenes, or 40 per cent of the whole quantity used for such purposes. The use of timber and building wood in manufactories and works may be calculated at 400,000 cubic sagenes.

The consumption of wood materials in the different working industries throughout Russia may, consequently, be estimated at the following figures, which must, however, be regarded as the minimum rather than the maximum:

Woodstuffs employed in chemical and mechanical operations, including ship building . . . . .	2,000,000	cubic sagenes.
Mining industry . . . . .	2,500,000	" "
Railroads . . . . .	800,000	" "
Steamboats . . . . .	300,000	" "
Manufactories and works. . . . .	1,900,000	" "
Total . . . . .	7,500,000	cubic sagenes.

If there is some kind of data for calculating the expenditure of fuel in the large industries, concerning the consumption of wood in private households there is nothing

more than suppositions to go on. The possibility of drawing trustworthy conclusions is rendered more difficult by the extreme variety characterizing the local conditions of the different provinces of Russia. In the northern districts, where forest land is abundant, the supply is far easier and greater than in the woodless south, where the peasants have learned to manage almost without wood. Take for example the majorat property of the Counts Stroganov, where the estates are admirably managed, and the proprietors arrange that the wants of a large population shall be fully satisfied, whilst all due and reasonable economy is strictly observed. Thus, for each stove in every cottage, 2·4 cubic sagenes are allowed; for each kitchen and bath stove, 1·1 cubic sagene; and for the barn, 1·5 cubic sagene; which gives for each family 4·6 cubic sagenes, for outbuildings about 0·6, and in all, 5·2 cubic sagenes. Naturally, the peasants of the central governments have not a like abundant supply, but still in the woody districts of the Vladimir and Nizhni-Novgorod governments the consumption amounts to not less than 3·5 cubic sagenes for each household, of which about 0·1 is employed alone in constructing fences. Between these quantities for the northern provinces and the almost complete absence of wood consumption in the steppes there are many intervening quantities, to trace for which there is no means at hand. Sufficient is known, however, to justify distributing these districts into five groups, in the first of which the mean quantity of wood fuel consumed is 0·7 cubic sagene per head; in the second, 0·5; in the third, 0·3; in the fourth, 0·2; and in the fifth, 0·1. Hence, the following results:

1st Group. Extreme northern and Cisural provinces, with 13,454,000 inhabitants, at 0·7 cubic sagene . . . . .	9,400,000	cubic sagenes.
2nd Group. Central Volga, Moscow, Lake, Baltic provinces, with White Russia and Lithuania, with 30,659,000 inhabitants, at 0·5 cubic sagene . . . . .	15,300,000	" "
3rd Group. Central province, with 17,508,000 inhabi- tants, at 0·3 cubic sagene . . . . .	5,300,000	" "
4th Group. Lower provinces, the woody portion of the Oukraina, and the Vistula regions, with 20,428,000 inhabitants, at 0·2 cubic sagene . . . . .	4,100,000	" "
5th Group. The steppe provinces, the Caucasus, and sparsely wooded portion of the Oukraina, with 29,034,000 in- habitants, at 0·1 cubic sagene . . . . .	2,900,000	" "
Total for population of 111,000,000 . . . . .	37,000,000	" "

This gives one-third of a cubic sagene as the mean quantity for each inhabitant of European Russia. Including what is required by different industries, it may be calculated that altogether 45,000,000 cubic sagenes of wood are yearly required in all Russia, not taking into account the large quantity sent abroad.

The exports effected in government forests are registered for each year with the greatest accuracy, and from the forest returns for the year 1891 it is possible to estimate the mean quantity exported at 1 per dessiatines for each of the five tracts. Now, if the same estimate per dessiatines for the remaining forest lands be taken, the probable quantity of exports effected in all the forest lands of Russia may be obtained,

supposing wood to be exported in the same ratio and quantity as from the Government grounds. The result may be set forth in the following figures:

Group.	Estimated quantity for home consumption.	Estimated quantity for exports.
	Cubic sagenes.	
1	9,400,000	1,800,000
2	15,300,000	5,100,000
3	5,300,000	1,700,000
4	4,100,000	1,700,000
5	2,900,000	1,200,000
Total.	37,000,000	11,500,000

Such a radical difference cannot be adequately explained by any incompleteness in the export returns for Government forest lands. Though in woody districts forests of half-grown trees are not included, the valuation according to the received system of sale by stretches of forest land will err rather on the side of underrating than overrating the total quantity, and these two circumstances taken together cannot result in an underestimate of more than 20 per cent in the returns of wood exports. It must, therefore, be supposed that a larger quantity of wood is exported from private than from Government forests. Thus, if 25 per cent, be added to the 4,000,000 cubic sagenes exported in 1890 from Government grounds the additional quantity falling to the share of other forests will amount to not less than 40,000,000 cubic sagenes, instead of 7,500,000 cubic sagenes, as reckoned in the Government normal tables.

The quantity exported from Government grounds is in truth very trifling, and it would only be a subject of great satisfaction if the excess of exports from private forests could be explained by their better condition and better management. But, though there are a few brilliant exceptions, it is generally acknowledged that the private forests are worse kept than those of the Government and their owners are generally content with striving to attain to the level of order and management observed in Government forests. Therefore, though it may be admitted that the management of Government forests is conducted in a too primitive and conservative manner, and that private owners can fell double the quantity of timber without injury to the forests, still the whole amount of the estimated deficit evidently cannot be covered in this way, and one must infer that in very many private forests timber is cut down in a proportion that considerably exceeds, not only the yearly growth, but trenches on no unimportant part of the wood in stock.

These considerations render it necessary to proceed to examine how a system of timber clearing that will not ultimately exhaust the forests can be brought into general acceptance and practice.

#### RELATION OF THE STATE TO PRIVATE FOREST LAND.

Till within a very recent period, forest property in Russia was quite free from all interference on the part of the Government; but constant complaints during the last

twenty-five years of the absolute destruction of private forests, and the fear lest the hills and mountains should be quite denuded of trees and the rivers become shallow, induced the Government to change its policy. At first, a few local measures were adopted, but subsequently, in 1888, statutes were drawn up and issued for the protection of forest lands. By this law, throughout all European Russia and the Caucasus the following kinds of forests and woods may be included under the category of preserved woodlands: *a.* those which serve as preventatives against the formation of dry sand tracts and their encroachment along sea shores or the banks of sailable and navigable rivers, canals and artificial reservoirs; *b.* those which protect from sand drifts, towns, villages, high roads, post roads, cultivated land, arable land of every kind, as well as all lands, the destruction of which might contribute to the formation of dry sand tracts; *c.* such as protect the banks of navigable rivers, canals, and spring sources from landslides, overflows, or injury by the breaking up and passing of the ice; *d.* such as are planted on hills, steep places, or on descents, if at the same time they serve to check land and rock slides, or prevent overflows of the soil by the formation of snow avalanches and sudden freshets. All forests that lie within these same limits and protect the springs and sources of rivers, together with their tributaries, to be included in the number of preserved forests.

By these standing orders for the preservation of forest grounds, or a portion of them, it is also forbidden to convert them into any kind of arable land, and moreover it is not allowed, without proper and official sanction of such intention, to cut down growing timber. The scheme of administration of all preserved forests has to be sanctioned by the local committee for the protection of forests, the committee having the right to forbid the complete clearage of a growing forest and to allow in its stead a gradual clearage, on condition of a natural renewal of the plantation. It may also forbid the uprooting of stumps and roots, if they are necessary either for the renewal of the forest or as a protection from overflows, slides, or the formation of dry sand tracts, the pasturage of cattle, the gathering of brushwood, and all other acts that in any way are likely to further the destruction of or do injury to forest plantations.

With the exception of the Treasury and Appanage Department the execution of forest works involving any outlay may not be imposed on owners of forests unless the owner consents. But in all cases when forest works involving any outlay are declared to be necessary for the good care of preserved forests belonging to any society, corporation, or private persons, and the owners of such forests do not consent to take upon themselves the necessary expenses, the Minister of Imperial Domains has the right to transfer these forests to the Treasury at a value estimated according to the rules laid down for indemnification of estates transferred from private owners to the care and administration of the Government. To the owners of such forests is reserved the right, for a period of ten years from the date of transference, of redeeming them by payment of a sum equal to that for which they were transferred to the Treasury, with further payment of all expenses that may have been incurred, and 6 per cent yearly interest on both these sums.

Statutes have moreover been drawn up for unpreserved forests belonging to any society or corporation; and these statutes apply to the whole of Russia, with the exception of a few of the northern, eastern, and Caucasian woody governments. They apply also to forests owned by private persons in the following governments: the Astrakhan,

Bessarabian, Vilna, and Vitebsk governments; to six districts of the Vladimir government; to the Volynian, Voronezh, Grodno, and Ekaterinoslav governments; to one district of the Kazan government; to the Kalouga, Kiev, Kovensk, Kursk, Lithuanian, Minsk, Moghilev, and Moscow governments; to two districts of the Nizhegorodsk government; to the Orenburg, Orel, Penza, Podolsk, Poltava, Riazan, Samara, Saratov, Smolensk, Stavropol, Taurid, Tambov, Tver, Tula, Kharkov, Kherson, Chernigov, and Esthonian governments.

In unpreserved forests, the conversion of forest soil into any kind of arable land is permitted only in the following cases: *a.* when it is required for the more profitable administration of the estate; *b.* for vintage cultivation, or the plantation of fruit trees, as well as for the temporary improvement of the economical conditions of the estate, provided that the cleared spaces of forest land be artificially replanted; *c.* for rounding off the boundaries of forest grounds, laying down roads, and erecting different constructions on the grounds; *d.* when fixing boundaries; *e.* when dividing property; *f.* when removing boundaries; *g.* when planting a forest on a stretch of land equal to that which it is intended to clear, and when the plantation on the newly planted portions have reached a growth of three years, and hold out every promise of further growth; *h.* in all forest stretches that have been artificially planted and have reached a growth of twenty years, if in their place no clearance of forest soil has been effected.

In unpreserved forests all wholesale clearance of growing timber are forbidden that may exhaust the stock of woodmaterial, render the natural regrowth of the forest impossible, and convert the cleared space into waste land. The pasturage of cattle is also forbidden in cleared spaces, or in young forests that have not reached a growth of fifteen years. In view of the difficulty of defining exactly the conditions under which clearance operations may be carried out, the owners of unpreserved forests are required to draw up all clearance plans and to submit such plans for approval and sanction to the committee for the protection of forests. On a plan being sanctioned, the proprietor of the forest ground is not subject to any limitation or restriction in the use of the materials of his forest ground, save those directly notified in the approved and sanctioned plan.

Forest proprietors in case of any fraction either of the law or plans presented and legally sanctioned, whether directly by themselves or by their stewards, are required to plant artificially the forest spaces they have illegally cleared or cut down, within a period to be fixed by the committee for the protection of forests, if the natural renewal of such spaces be recognized as impossible. Should the forest proprietor fail to carry out these instructions within the fixed period, or should the artificial plantation of the cleared spaces be executed in an unsatisfactory manner, the work will be undertaken and executed at his expense at an estimate sanctioned by the committee for the protection of forests, and through the agency of its clerks.

For the introduction and due execution of the law, there have been formed in each government committees for the protection of forests, under the presidency of the Governor-General, and composed of the representatives of the local administration, the justice of peace, the County Council, and forest owners. The committee is invested with large powers, since it alone can decide, without appeal, what forests shall be included among the preserved forests, and has the power to sanction plans proposed to be carried out by the owners of unpreserved forests. All plans relating to unpreserved forests are drawn up and presented at the expense of the owners; those relating to pre-

served forests are drawn up by Government technicians at the expense of the Imperial Treasury. Up to January 1, 1893, plans had been confirmed relating to preserved forests in 896 grounds, and relating to forest lands extending over 313,000 dessiatines; whilst plans had been confirmed relating to unpreserved forests in 5,611 grounds, and relating to forest lands extending over 2,361,000 dessiatines.

As yet, it would be premature to judge of the results obtained by this law for the protection of forests, since all will depend upon the way in which the local authority, the committee for forest protection, uses its large powers, which readily admit of being applied to satisfy real local wants and requirements; and if, at the same time, means are sought to make its control real and effective, the law will then accomplish all that can be expected from it. Once the people have been accustomed to observe a reasonable and economical management of forest land, they will begin far better than now to serve the true interests of the country without any interference on the part of the Government being required, and, on the other hand, should it prove necessary, the supervision of the Government can be strengthened and made more strict.

Of equal importance with these restrictions are the protective measures included in the general law for the preservation of forest land. Thus, in each province, the Government maintains a special forest technician, an inspector-instructor, whose duty it is to advise all who may address themselves to him on questions relating to forest industry, and as far as circumstances permit, to superintend on the spot all forest work. Besides this, private forest owners are enabled to purchase saplings from the Government nurseries at a very low prices, as well as tree seeds from Government foresters.

Previously to the enactment of this law, forest owners had been permitted to appoint clerks and officials serving in the Forest Department as administrators and managers of their forests. In accepting such a place, these officials have the right to count themselves as still actually in the service of the Forest Corps, and to receive a salary equal to that of Government foresters. There are at present 196 of these officials in the service of private forest owners, and their number increases every year. Independently of all this, each year, medals and valuable money prizes, amounting to 500 roubles gold are awarded to forest owners for excellency in forest culture and management.

No little benefit has been derived by forest owners from the establishment of the Imperial Loan Bank for the Nobility, which advances long termed loans on forests on the bases of detailed plans of the state and condition of the forests: the plans being drawn up, not so much with a view of showing they afford a good security for the loan, as that the forests will be well preserved beyond the period of the liquidation of the loan.

Lastly, the Government has rendered a very great service to private proprietorship in forests by the establishment of forest schools. Independently of the Chair of Forestry in the Petrovsk School of Rural Economy, in the Riga Polytechnic School, and in seven middle schools of rural economy, there exist in Russia an Institute of Rural Economy and Forestry at New Alexandria in the Vistula provinces, and the St. Petersburg Forest Institute. The last named establishment, which has under different forms existed ninety years, is under the jurisdiction of the Ministry of Imperial Domains, and forms a high school of forestry, with a full program of studies in the natural sciences, in every necessary branch of forestry, and in all the sciences connected with or bearing on that speciality. The institute has unusually large means at its disposal, and young people are

able to receive a solid education in the natural history sciences. The instruction given in forestry, owing to the want of a forest ground belonging to the institute, is mainly theoretical; but this want is to some extent supplied by the organization of summer practical studies in the large Government grounds as Lissinsk, about 80 versts from the institute. The number of scholars is a little above 400, and the teaching staff consists of 16 professors and 7 assistants.

There were, in addition to these, thirteen lower forest schools, which were established to take the place of three previously existing middle schools. These establishments are admirably arranged and conducted; the instruction given is chiefly carried on in work in the forests, and, as will be well understood, the attention of the scholars is chiefly directed to the local conditions of forestry. Pupils, on leaving these schools, for the most part enter the civil service by obtaining places on Government forest grounds, but private persons constantly avail themselves of the opportunity of profiting by the comparatively cheap services of these well prepared and well educated technicians.

It would be unjust not to mention the great service rendered to the spread of a sound knowledge in forestry by the foundation at St. Petersburg, at the initiative of a private person and without any subvention from the Government, of the Forest Society, which issues a monthly journal specially devoted to forestry, and has held a whole series of congresses at Moscow, Lipetsk, Warsaw, Kharkov, Kazan, and has made arrangements for a congress this year at Kiev. The sympathetic support accorded it on the part of the public led to the establishment of a branch institute at Moscow, and which, in 1889, was transformed into the Moscow Forest Society, being the third in Russia, since there has for very many years existed at Riga the Baltic Forest Society.

#### TECHNICAL FOREST INDUSTRIES.

Articles made of wood materials have never formed in Russia a principal object of manufacture; but on the other hand, the large forests have furnished a whole series of the most varied village home industries. It is impossible to give even an approximate estimate of the money turned over in these industries, but the total amount must be very considerable, and without doubt, they are strong concurrents of the large manufacturers.

Amongst these industries articles made of wood occupy a prominent place. Though of course, it has taken deepest root in wooded districts, it is not only in the northern but also in the central and even in the southern districts that this branch of industry is found to be greatly developed. Near the Black Forest, in the Kherson government, the peasant colonies occupy themselves with making articles out of wood stuff, so that the environs of the Black Forest and other large forests in the south are little more than a widely extended range of village trade shops for the production of various wooden wares. All that part of Russia which is not completely denuded of trees is covered with a number of peasant trade homes: carriage makers, coopers, joiners, turners et cetera, who supply the whole district around, and frequently more distant places, with their cheap productions.

But notwithstanding the existence of these natural centres of industry they are to an extraordinary extent and in a very original manner specialized centres. Thus, it is

noticed that in the greater number of cases the inhabitants of one village occupy themselves with one branch of a certain industry, those of another village with another of its branches, and it is very seldom that one meets with more than one branch of an industry in one and the same village. Very often different villages, though situated close one to another, will divide among themselves the production of the component parts of one and the same article. Thus, the special occupation of some of the villages in the Semenovsk district of the Nizhni-Novgorod government is the manufacture of spoons in the rough, whilst the inhabitants of a second village will turn them, and those of a third will paint them, but in no single village, and in no single family, is the complete spoon made in its entirety. It is the same with nearly every other article of production. For the wheelwrights of the village Okoulovo, in the Mouromsk district of the Vladimir government, the inhabitants of the neighbouring village, Yartsev, have from a remote period prepared their spokes; and similarly, for the wheelwrights of the Morshansk district of the Tambov government the villagers of Rokscha in the same district prepare the naves of their wheels. And in general, this division of labour is made, not among separate individuals, but among separate villages.

When once an industry has become an established occupation with the inhabitants of any particular locality, it continues to be its peculiar speciality, even when the necessary natural materials have been exhausted, and the village handworkers have their materials imported to them sometimes from a considerable distance. Thus, the well known *telega* manufacturers of the Soudogodsk district in the Vladimir government procure their wheel felloes from the Kazan and Kostroma governments, their cross-pieces from the Tambov government, and their lime bast from Kassimov in the Riazan government. In order to procure these materials, the village handworkmen from associations of shareholders, choose trustworthy commission agents for buying, and sometimes, if the place is very distant, providing a stock of the required materials; and it is interesting to note that this stock will always be divided among the shareholding associates with the utmost fairness and without disputes or misunderstandings. In cases of sale, on the contrary, each villager acts for himself and on his own account, and this is probably why the village handworkmen are generally less successful in selling their wares than they are in concluding cheap and profitable purchases. It is seldom that village handworkmen dispose of their wares at home, and far oftener they bring them to the principal fairs and markets, where they either dispose of them direct to their customers or to middlemen, through whose services their wares are circulated in the most distant parts. Not seldom a particular industry has become localized in consequence of the large demand for its products in the locality itself. So, the hawkers of the Vladimir government require a large number of *telegas* and sleighs, and for this reason the manufacture of *telegas* is mainly concentrated in places chiefly inhabited by these itinerant dealers in small wares.

Both the Government and different societies and associations have always extended their protection to the support and development of village hand industry. For this purpose they have formed stores of its various products, established special working corporations, and opened museums in St. Petersburg and the other principal cities of Russia.

In consideration of the great importance of village hand industry in respect to articles made of wood, it is absolutely necessary to take a review of its chief and

principal branches. Its carriage industry is mainly confined to the production of the simplest and rudest kinds of equipages, which are, however remarkable for their cheapness. At the same time, the transport cars made in the New Russian provinces are valued for their excellent quality, and the same may be said of the tarantasses made in the Viatsk district, where, in the Troitsky volost and the villages of the Appanage Department, are prepared tarantasses, waggons with and without springs, jaunting cars, droskies which take the place of double staled barouches, winter vehicles, et cetera. Small hand sleighs form a distinct branch of the sleigh manufacture, and in the village Khokhalakh, in the Semenovsk district, this industry is developed to a considerable extent. In the village Pogoriel'sk in the Shuisk district of the Vladimir government, about 2,000 sleighs, made of juniper wood, are turned out a year. Another great centre of sleigh manufacture is the village Boldino, in the Loukoyanovsk district of the Nizhni-Novgorod government, which supplies Uralsk and Gouriev with sleighs.

To enumerate all the villages occupied in the manufacture of telegas and in which the industry has attained considerable dimensions, is impossible, but it would be unjust to pass over a genuinely Russian branch of the trade, namely, the manufacture and preparation of shaft bows. In the village Tamareshk, in the Laishevsk district of the Kazan government, out of the whole number of 100 households 60 are occupied with preparing and making shaft bows, and a single family, in which there are three working hands, makes from 700 to 1,000 in the winter; whilst a large family makes as many as 3,000. Women are also engaged in this work. The Laishevsk shaft bows used to be made of elm forest, and now, since that kind of wood has been exhausted, are made of field elm. The field elm logs are well steamed, and are then laid on a block, are braced at the ends, and, when they have cooled, are taken off the block and trimmed, first with a hatchet and then with a double-handled chip-axe. Whilst it is drying, different figures and patterns are cut on the shaft bow by means of an oimara, a kind of half-round gouge. Lastly, the shaft-bow is painted in olive colours with a preparation from the bark of the sallow thorn. These shaft bows are sold in sets at the fairs held at Simbirsk, Samara, and Kotelnietchi, in the Viatka government.

Another natural material much used in the manufacture of shaft bows is the white willow (*sali*x), often grown by the peasants for this express purpose, and cultivated by them with great care and strict observance of certain rules resulting from long experience. In this way the peasants of the Loukoyanousk district, having learned by experience that an injudicious choice of soil robs the willow of its peculiar qualities that render it fit for use in making shaft bows, form their willow plantations chiefly in gullies, near which is a flowing river with a light slimy bed. The trees are planted with the greatest care; the land, if necessary, is well manured; fitting measures are taken for draining off superfluous water; each of the upper topped branches is pasted over with clay earth; besides which, they are protected and trussed with matting; the surrounding soil is mellowed; and the weaker offshoots are pruned. In a word, they are cultivated with such care and zeal, that, in round numbers, a dessiatine of willow plantation costs a peasant nearly 300 roubles. In return, however, for all his care he obtains in the course of eight to ten years from each dessiatine wood sufficient for 5,000 shaft bows. In the Loukoyanousk district of the Nizhni-Novgorod government there are many such plantations, as well as in the Saransk district of the Penza government, though in the latter the plantations are very small, generally measuring a quarter of a dessiatine, and

even less. In calculating the cost of cultivating these plantations, if one takes into account the five per cent compound interest and supposes the yearly rental of the land to be at the rate of 25 roubles per dessiatine, the net profits per dessiatine will amount to 100 roubles a year. The willow is considered to be ready for manufacturing use when it has grown four inches in thickness and three arshines in height. The market price of a shaft bow varies from fifty kopecks to two roubles, the price depending on the width of the bow, the quality and colour of the wood, and the general finish of the work.

The only other important branch of telega manufacture of which will be discussed here is the preparation of oxbows which are in use in many places, particularly in the Kalouga government. They are made of birch and maple wood, which the peasants dry in the air for a whole year, and choose with the greatest care. Having sawn off a log into rough square shape, the workman lets the dry well indoors for two or three weeks, after which he begins to work it into oxbows. He sells his wares either on the spot to merchants, of different towns, or himself conveys them to Kursk, Livny, Elets, Bolkhov, where he will generally exchange them for rye.

The cooperage industry is scarcely less developed than the manufacture of telegas. There\* are in Kstien volost, in the Viatka government, more than 2,000 coopers, whose wares penetrate to Saratov, Astrakhan and Siberia. The best coopers are in the Spassk district of the Riazan government; they procure their materials from Kazan, and their wares meet with a brisk sale in the south, in the wine districts of which they are preferred to any others. The cooper trade has also become concentrated in places where the local conditions are favourable. Thus, in the Spassk district of the Kazan government the abundant growth of the willow (*salix*) on the Volga islands has caused many villages to become the centre manufacturing points for cask-hoops, which are transported in great quantities to the merchants of Astrakhan.

The different kinds of small wares made of wood in Russia are extremely numerous and varied; those in greatest practice are such as are required and used in other peasant industries. For example, an enormous number of slaiies (weaver's reed) are prepared in the trade circles and one volost in the Egoriev district of the Riazan government, makes them of birch wood and amounting to no less than 500,000 pieces a year. The sliae makers of the town Biezhetsk, in the Tver government, are accustomed to go to the south, were they repair old slaiies, buy reed splits for the teeth, get metallic reeds in Moscow, and the necessary quantity of birchwood they have at home. The central points of the manufacture of carding combs are to be found in the trading districts, particularly in the Vladimir government, though the maple wood has to be procured from the Kalouga forests, and often even from the western governments. In the Shouisk district of the Vladimir government more than 250 persons are employed the whole year through in making carding combs, and up to 70,000 pairs are prepared. The wood is bought in Kalouga, and their sale extends to Yaroslav, Pless and Mourom. Spinning wheels are made in the Medynsk district of the Kalouga government, whence 10,000 men set out to conduct their trade in parts of the country quite unknown to them, and bring to the Oukraina and the Caucasus for sale a number of spinning wheels of every kind and shape. But, perhaps, the best spinning wheels are those prepared by the well-skilled workmen of the village Velikoe in the Yaroslav district to the number of 1,500 a year. There also, as in many other places, spinning looms are prepared. In the village Lietnevo, in the Shouisk district there are 25 households occupied in the manufacture of 3,000 harrows a year.

They are made of fir wood, their rings being made of juniper wood, and their teeth of oak.

Among joinery manufactures, the most original is that of wooden packing trunks, mostly made of alder wood, and which, from their lightness, are much sought after for the package of goods, and particularly those addressed to places in the distant east. For the transport of the trunk itself, it is made of such proportions that several trunks can be packed one in the other. A part of the trunk is left unpainted, the other part being painted in bright and gaudy colours, and tipped with iron. Merchants' wives and well-to-do peasant women are fond of keeping their household utensils in these trunks. A large number of them is in use in Persia and throughout the east. The Macariev district in the Nizhni-Novgorod government, the Bagration volost in the Mourom district, and the Verkhotoursk and Ekaterinburg districts of the Perm government form the centres of this industry. Very good, durable, and well finished, but by no means cheap furniture is turned out in the Troitsk volost in the Viatsk district by a corporation of workmen who learned their trade from a German that came from Kazan and settled in their volost for a while. Some of them can make pianos, but only after a pattern. There are also in the same volost 400 peasant workmen who make simple and extremely cheap furniture, which meets with a ready sale in places along the Volga and also at Menzelinsk, and in the fairs at Nizhni-Novgorod and Irkutsk. The peasants of Zvenigorod district make furniture in nutwood for the Moscow stores. Parquet floors are prepared in the Alatyrsk district of the Simbirsk government, and especially in the village of Porietsk.

Carpentry rarely forms a branch of village hand industry; the principal exception being the preparation of window frames for peasant houses in the Balakhninsk, Syzransk, Gorbatovsk and Kotelniechesk districts, and particularly in the village Zhadowka in the Simbirsk district, its wares finding an easy sale in places as far removed as Kazan, Orenburg and Siberia. In the Kassimov district of the Riazan government, cottage doors, as well as doors in general, and door or window jambs are made, though their sale is not very great, whilst their wall frame work are found in all our markets. A very large business is also done in dove-tailed coffins, in use among the sectarists, and made of solid pine wood. They are chiefly made in the villages lying on the rivers Vetluga and Kerzenets.

The manufacture of spoons is especially worthy of attention. It is mainly concentrated in the Semenovsk district of the Nizhni-Novgorod government. The principal materials employed in it are birchwood, supplied on the spot, to a less degree pinewood, and still less imported maplewood and laurestine wood (*buxus sempervirens*). More than 7,000 persons are engaged in the Semenovsk district alone in this industry. From each load of birchwood, about 0·1 cubic sagene, 400 spoons are made; one workman turning out each day about 180, and the entire number prepared in the district amounting to not less than 126,000,000 a year, and in the production of which more than 30,000 cubic sagenes of birchwood are employed. The spoons are priced at from six to eight roubles a thousand. The wholesale spoon trade is in the hands of some ten merchants, and all its products are sent first to the village Gorodets, on the Volga, and thence to Nizhni-Novgorod and Irbit. The Semenovsk spoons are transported to Persia, China, Bokhara and Kokan. The industry is divided into three principal branches: first, the spoonmakers prepare a spoon in its rough outform, for which purpose they saw the birch logs into blocks 5 inches in length, split the blocks into halves, and square one of the ends which is to serve as the handle. In this shape such blocks are called "spoon-blocks". The block

is next rounded, so that a circular shape is given to the bowl portion; after which, this part is hollowed out, and with a turning-gouge the outer surface is pared and the inner surface is cut into an oval form, so that, when it has been planed quite smooth, it has already the shape and form of a spoon in the rough. Secondly, when the spoons are in this stage of preparation, the spoonmaker takes his wares to the Semenovsk market and sells them to a middleman, who, in his turn, gives them into the hands of a turner, who edges off the ball-shaped tip of the handle and, by way of ornament, makes on the handle a series of bossed spiral lines. Thirdly, the spoons are now subjected to a process of bleaching, that is, their surface is cleansed by means of alum and a threefold colouring given them, being well dried in a stove after each colouring; they are then coated with varnish and kept for a night in an air-tight stove, and thus are effectually hardened and seasoned. As is thus seen, an ordinary wooden spoon has in the course of its manufacture to pass no less than fifteen times through the hands of three specialists.

In this same district, and also in the Kostroma, Viatka, Vladimir and Novgorod governments are manufactured by the peasants original kinds of furniture in the Russian style. The furniture itself, footstools, chairs, sofas and tables, is rude in work, but the staining is varied and very durable. Cups, dishes, glasses, and other domestic utensils are also prepared in wood, and of these a by no means small proportion is sent abroad, where dealers in such wares find a ready sale for them.

Small manufactures in wood of every kind are also carried on by the peasants, and in many of them they have attained a high degree of perfection; but for the most part these productions are of a rude character, though they command a great sale and are turned out in large numbers. Among them may be noticed childrens toys, in the production of which the whole village of Bogorodskoe, in the Alexandrov district of the Vladimir government, to the number of 150 persons, as well as the neighbouring villages are employed, making in all 600 persons. These products are sent to the Sergiev faubourg, and from thence to Moscow, Nizhni, Irbit, and the Oukraina markets. In many places spindles are made. In the Vassilsourisk district of the Nizhni-Novgorod government buoys are made for Kazan; in the Petropavlovsk parish, in the Viatka government, excellent wood carving is turned out; in the Shadrinsk, Ekaterinburg, Zvenigorod, and Bronitsk districts small turnery wares are produced; and in the village Serednevo, in the Shouisk district, weaving shuttles of boxwood, bobbins, and spools are made. In some of the volosts of the Viatka district, 30,000 pipes, 15,000 cigar holders, 10,000 candlesticks and saltcellars are made each year. In the Vereisk district of the Moscow government, 30,000 abacuses, or calculating boards, are sent for sale to the Oukraina markets alone.

The Tula district is famous for its manufacture of harmonicas, the work being divided among seven different master workmen. This industry, which was founded by two peasants, has already existed for 50 years, and 240,000 harmonicas are turned out a year: their sale being effected in Moscow, Nizhni and the Oukraina, a very large number being sold to new recruits. They also find a ready sale among Armenians, Persians, and Bucharians. Harmonicas are also made in the Viatka government; whilst the fishharmonicas, with twenty-two keys, made in the villages Istobensk and Khlynovka are distinguished by their excellent finish and rich varied tone. Their price reaches as high as 40 roubles, and Viatka merchants frequently send these home productions abroad, where they sell for 150 roubles. Organs and violins are made in the Velikoretsk district of the Viatka government.

Extremely original are the products made from knots, the abnormal excrescences on the bark of a tree, which, when cut vertically, present pretty wavy or marble streaked patterns, with a mother of pearl or rainbow tint. Up to the present, birch knots are almost exclusively used as being the prettiest, the most durable, and the most easily worked. Lime tree knots, which are like birch knots, but softer, alder knots, which are extremely beautiful and highly valued but very rare, pine and fir knots, which are of a lighter and more streaked pattern but too resinous to be easily worked, are also used. There are three classes of knots: needle knots, the most costly; brush knots, growing out of the neck of the stump and which cost twenty per cent less; and smooth knots, the surface of which is perfectly smooth, and which cost twenty per cent less than those of the second class. Knots of the best kind are rare, and for the most part measure three vershocks, selling at 2 roubles; those measuring four vershocks sell at 4 roubles; those measuring five inches sell at from 15 to 20 roubles; those measuring six vershocks or more in thickness are sold at 4 roubles per vershock. All these prices hold good only for knots of the first class. It is only in two workshops, one at Slobodsk, in the Viatka government, and the other at Viatka, that this industry is carried on to any large extent. The best knots are found in the Viatka government, and in part are procured from Vologda. The joiner, Makarov, has carried on his trade at Slobodsk for above seventy years, and, owing to the protection of the Government, has brought it to perfection, his wares being especially characterized by their fineness and durability. A good half of them, in the shape of tobacco boxes, cigarette cases, tea caddies, sugar basins, glove and cigar boxes, match boxes, album covers, studs, et cetera, are made to order of Mr. Knop, head of the well known firm at St. Petersburg. The other workshop executes local orders. The industry merits to be further developed, nor can deficiency in knots be well pleaded as a reason for allowing it to decline, since they can at the high price they command be procured with profit from the most distant forests.

The peasants of the Kstien volost in the Viatka district have found an original use of birch bark, from the cuttings of which they make circular layers or plates, with holes in the middle, and thread them on to an iron bar, after which they are closely fixed with a screw on one end of the bar, to which is attached a handle, generally made of a knot, whilst at the other end of the stik a tin feule is soldered on. The stick is then rounded on a turning lathe, polished, and covered with a layer of varnish; and the outcome is an extremely pretty cane, at the same time elastic and sufficiently heavy. The peasants sell them for 50 kopecks a piece, but they are resold to the public for double that price. These walking sticks were much admired at the London Exhibition in 1862, but the industry has not received any further development. In Kazan from birch bark are made tobacco boxes, purses, cigar cases, and other small articles adorned with most eccentric patterns, designs, and portraits, cut in with a needle. In the Olonetsk government, cables are twined out of birch bark and are much approved for their durability, since they will last for ten years. Much more important, because far more widely spread, is the use of birchwood for small, round, high, cylindrically shaped canisters. They are produced at Nizhnichousov in the Perm government at the rate of 100,000 a year and are famous for the pretty fashion in which they are ornamented on the outside. An equal number is also made in the village Kamentsy, in the Vladimir district. They are sold from half a kopeck to ten kopecks a piece.

It was also at Viatka that the new industry, known as «strewings», took its rise.

It consists in strewing a composition made of sawdust over gum on portrait frames or other like articles made of wood.

An other original and important industry is the use of lime bark, or strictly speaking, its inner bast coating. Stems from  $\frac{1}{2}$  to  $1\frac{1}{2}$  vershoks in diameter are used in the preparation of bast. Such stems are cut down in the spring, when in their prime and full of sap, and the bark is removed by means of an iron hook, called a k a d a t c h. The upper coating of the bark is cleaned with a knife, and the soft thin bast is cut into strips of half a vershok. The bast is generally stripped off in the forest, but sometimes the peasants bring home whole stems and then at home strip off the bark; it also happens, though seldom, that the stems are cut down in the winter, in which case they are well dried indoors. The bast is bound up in bundles for sale, there being generally 60 pieces in a bundle, but if the pieces are small there will be 100. Thick bast is tied up in bundles of 30 pieces, for which a higher price is paid than for an ordinary bundle of 60 pieces. The length of the piece is generally 3 arshines; they are seldom longer, and in that case are sold by the piece.

From bast are plaited bast shoes, the tools used in their production being the k a d a t c h and boot-tree. Twelve pieces of bast go to one pair of bast shoes, and as a lime tree yields three to four bast pieces, three or four young lime trees are required for each pair. The large majority of those who live in the northern and eastern parts of Russia habitually wear these shoes, so that the demand for them is excessively large. It is not possible to give an exact return of the number made, since they are in numerous instances made by the wearers themselves, or very often by the elder members of a family, who from their age are ill suited to other kinds of work. There are, however, certain centres of bast shoe industry. Thus, in the village Smirnov, in the Ardatov district of the Nizhni-Novgorod government, about 300 persons are occupied solely with this industry, each of them making 400 pairs. They are made on an equally large scale in the village Ouzhovka, in the same district, and are chiefly sold in the Tula and Voronezh governments. In the village Semenov, near Kieneshma, bast shoes to the value of 100,000 roubles are made a year, and are sold over all Russia. The bast industry is greatly practised in one of the volosts of the Shouisk district, and from the village Mieth alone 500,000 pairs of bast shoes are sent to Moscow.

Bark from large trees is chiefly used for making bast twist. For this purpose a lime tree is cut down late in the spring or early in the summer, when, in consequence of the warmth of the air and sappiness of the fibres, the bark can easily be stripped. The tree is cut in such a way that it falls into two pit holes arranged for that purpose; circular cuttings are made on the bark at a distance of  $6\frac{1}{2}$  arshines one from another, that being the accepted length of a bast wisp. A longitudinal cut is next made on each portion, and the bark is easily stripped, either with the hand or by means of a sochal, a sharp-edged wooden trowel about two inches in width. One man is able to strip the bark of fifteen trees a day, and his mate will bring it to the soaking place. As it is carted in the summer through dense forests, where there are no roads, and the way is often choked with wind-fallen trees, the transport is too difficult to be made with wheeled vehicles, and for this reason a peculiar kind of sleigh truck, called a v o l o k, is used. A volok consists of two rough fir logs, the ends of which are fixed in a rude kind of screw block and are joined together in the middle by a thin crossbeam: the horse is harrassed to the

logs, as to any ordinary shafted vehicle, and the strips of bast are packed across. The soaking place is generally a forest stream, a lake, or any bog ditch. For transport the smaller strips are packed into the thicker ones, so that they make up into bundles of from three to six strips. The bundle is dipped into the water and upon it is laid a heavy weight, for the bark must be soaked from  $1\frac{1}{2}$  to 3 months, according to the temperature of the air, the thickness of the bast, and the circumference of the bundle. By this soaking process the outer layer of the bark is peeled off, and the bast itself becomes soft, loses its mucous, slimy qualities, falls away into yarns, in a word, turns into bast twist. The way in which the soaking process is carried out is a matter of the greatest importance. This is why the peasants try to find a good soaking place, warm and with plenty of water, carefully regulate the pressure of the weight from time to time, and are cautious in not letting the soaking place dry up in the hot weather, to prevent which they are frequently obliged to dig ditches. When taken out of the water, the bast is strewn out on the bank and laid bark downwards, cleared of all slime, and thoroughly cleaned. The bast twist can then be easily separated from the outer bark with the hand, though practice and a light touch are necessary; the stripped bast twist is hung on poles in the forest to dry, and on the approach of winter, or earlier when the soaking place is near, is brought home. A lime tree of the average dimensions, that is to say, 4 inches thick in the trunk and 4 sogenes high, yields about 15 pounds of bast twist; and two men with one horse, if they work two months at felling and soaking, one month at taking it out from the soaking place, and another month in transporting it, will be able to prepare about 280 pouds of bast twist.

Bast twist is principally used in making matting and sacks, to make which peasants arrange behind their huts special looms, with slates composed of a row of wooden teeth fixed above and below into straight wooden beams. Two workmen are occupied with the weaving operation, whilst a third separates the bast twist into strips, and sorts and ties the warp threads, which are formed of the best, that is, long, soft and strong twist. The three are able to weave 20 matting pieces, or 15 sacks a day, including the sewing up of the latter. In different localities different kinds of matting are found. In the Vetylouzhsk district, on the Vetylouga, a tributary of the Volga, are made *tatefka* matting, a very light and closely woven article, and used for covering goods; sail matting, of a coarse quality but made in large pieces, and used for the sails of a peculiar Volga craft, called a *belyana*; one and a half (*poloutornai*), matting, of a lower quality; thick yarn matting, of a still lower quality, used together with the one and a half matting for bedding; and lastly, small matting. One poud of bast twist is used in making from 5 to 12 matting pieces, according to size. There are three kinds of sacks: the heavy, made to hold 9 pouds of rye flour; the light, or inferior, for 5 pouds, and the middling. From 5 to 7 sacks are made out of a poud of bast twist. The so-called double sacks consist of two inferior sacks, or in order to make it more durable, an inferior one, is inserted into a middle sack.

The amount of bast twist produced in Russia is extremely large. Thus, in the Viatka government about 500,000 trees are every year felled for bast twist, 900,000 sacks, and 600,000 matting pieces being made at the cost of 340,000 working days. In the Vetylouzhsk and Varnavinsk districts up to 100,000 pouds of bast twist are prepared, in which work 700 persons are employed during four months, and 650 persons in weaving sacks and matting. The best Vetylouzhsk matting is produced in the village

Louguinine and is well known in England. In the Oufimsk and Biersk districts bast twist is produced up to 200,000 pouds. In the Penza government not less than 200,000 matting and double matting pieces are produced, and in the Kochkourov and Zhiropin volosts, in the Loukoianov district, 500,000 sacks are made for Morshansk. In the Macariev district, on the far side of the Volga, the principal industry of the population is the preparation of bast twist wares for the merchants of the village Lyskov. A large quantity of bast twist is prepared for Riga in the Minsk government.

The roughest bast twist, as well as the roughest bast bark, is used for rigging work, that is, for cables employed in raft floating; in Vetyluga alone 15,000 pouds are used in this work, for 1,500 rafts. Lime bark is also used in the preparation of dry or covering bast, generally three arshines long, and used to cover boat cabins and particularly in preparing packing hampers. Almost all stuffs are packed in Russia in hampers of this kind. Riga is supplied with them by the western governments, Moscow by the Vereisk district, and Shouisk prepares them for the surrounding localities. In the Veliezhsk district of the Viatka government a large number of round bast hampers, called loubiankas, are made; and in the Kostroma government alone up to 50,000 bast baskets of aspen are prepared. A very considerable quantity of thick bast is also used in making sieves, a number of which are prepared in the Kalouga government. The village Ziemenschina, in the Kovrov district, turns out 1,500,000 sieves a year, the bast being procured from the Nizhni-Novgorod and Tambov governments. In general, articles made from bast are prepared in some particular centre and not in the place producing the material. Thus in the Melenkov district, in the village Grigorov, 300 persons are employed in matting weaving, but the bast twist is procured elsewhere; the Orlov district of the Viatka government, where there is no growth of lime trees, does a greater business in matting and sacking than all the other districts and uses in this industry 85,000 pouds of bast twist, which is partly brought to the village Ouni from the Malmizhsk and Glazovsk districts and the Perm government, and partly by the river Viatka from the Menzeliensk district.

The distillation of pitch and tar forms one of the oldest industries in Russia, and has up to the present day remained outside the sphere of large industries, and has always been centred in little factories where the owner is himself at the same time a workman. In very early times the products of this industry not only served to supply the home demand but were also largely exported. At least, it is said on trustworthy authority that in the thirteenth century Kiev was trading in pitch and tar with Breslaw, and that, when Novgorod belonged to the Hanse League, pitch was an important article of its foreign trade, though it had to be procured from the most distant parts of the Russian territory.

Pine forms almost the sole material for the production of pitch, whereas in earlier times in Russia, as in Germany, fir wood was much preferred. Of all parts of pine wood the richest in pitch are the stumps and roots which yield the so-called osmol. To facilitate the uprooting and also to increase the resinousness by distillation of the sap, the pitch is not at once extracted at the time of felling, but some ten to twenty years later, the pitch obtained from the roots of the tree that grow vertically deep being particularly valued. The pitch is often dried not only in the air but also in drying stoves, since it has been found that with the use of damp pitch, products of a less satisfactory quality are yielded. The pieces of the stem of a tree that chance to be filled with pitch are eagerly seized on by pitch distillers, especially those portions of it that,

owing to the ravages of the fungus, *aecidium pini*, are choked with pitch; and not so very long ago, it was a common thing to cut down a whole tree for one such stem-joint, but the price of timber has since risen so high, that the employment of such a method is far too costly.

Pitch distillers still use old wind-fallen timber, which of course may be of very good quality, especially if it be the wood of secular trees, such as are found in the Sarov forests, in the Tambov government, where from time to time thoroughly healthy pine trees fall, of fifty years growth, and the trunks of which are still sound. But, generally speaking, pitch from fallen timber is not very good nor profitable.

To increase the quantity of pitch-producing wood, it is usual in the Archangel and Vologda governments to peel off strips of pine bark, from two to three arshines in length, the first year from one-fourth of a tree's outer surface, the next year from another fourth, and so on. The consequence is, the tree steadily dries up, and in the bared portions pitchy substances are formed. These are scraped off in the form of white resin, and when they are exhausted the wood itself is used for pitch, which, however, is very inferior to that extracted from the stumps.

Pitch when subjected to dry distillation yields various products, of which the most important is pitch oil, a fatty fluid principally composed of a solution of pitch in turpentine oil and creosote. Of the different sorts of pitch known in trade, the most used are thick black pitch, distilled pitch, Swedish (red) pitch, almost from volatile substances, roe pitch, presenting not one homogeneous fluid, but, as it were, a mass of roe pips floating in the pitch; and lastly, an inferior kind, a mixture of pitch and water, which is obtained either from an inferior material or in consequence of unskilful distillation.

As trade pitch consists chiefly of substances of a twofold kind, resin and volatile oils, all further processes to which it may be subjected are principally directed to the separation of these main ingredients one from another. In the process of rectification, the resin yields itself in a solid form, and in this shape is called pitch; but the volatile oils, with a mixture of the resin attracted during the process, settle in the form of turpentine, and are called, according to the degree of solution, red, yellow, or white. The last is only obtained by a complete rectification of the resin, but the creosote can never be entirely separated, and the best pitch turpentine, though perfectly colourless, will still have an unpleasant smell.

Turpentine that is free from this smell is only to be procured by its distillation, not from trade pitch, but direct from sulphur. Such turpentine amply replaces the turpentine obtained from the west, in many different sorts imported into Russia. Of these may be mentioned the American, from the white pine or *pinus strobus*; the French, from *pinus maritima*; the Hungarian, from *pinus pumilio*; the Corsican, from *pinus laricio*; the Venetian, from the larch; and the Strasburg, from the fir.

If sulphur turpentine forms a product analogous to pitch turpentine, colophany or rosin corresponds to pitch obtained by distillation of trade pitch. Colophany, or rosin, is a well known, fragile, transparent substance, of a brownish colour, with a glossy breakage, and is distinguished one from the other solely by the proportion of water. Colophany is obtained from sulphur by a distilled extraction of turpentine, and might form the chief article of a special industry, but Russian colophany, in consequence of the carelessness of the operators, is not distinguished by any excellency of quality.

In the residuum formed during the process of pitch distillation is found a watery fluid, hepatic or sulphurous water, from which can be obtained methyl alcohol and pyroligneous, or wood spirit. In Russia, only the last is obtained, and independently of some of the larger chemical laboratories, the production of acetates is the object of a small village industry in the Yaroslav government.

The extraction of pitch was already practised in Russia in the sixteenth century, and even earlier; the extraction of turpentine, in the first half of the eighteenth century. The later forms of such processes as the preparation of grease oils, which was so much written about twenty-five years ago, have not up to the present taken real root in Russia.

As regards more technical modes of pitch distillation, in some places the old primitive method is still kept up of burning the pitch in pots, called maidans; in such cases pitch is often used for fuel. These were followed by the construction of stoves with chimney hoods, that is, two concentric walls, in the interval between which the fuel was placed; and they, in their turn, gave way to more perfect methods, such as earthen retorts and alembics. In the latter case, the earthen pots formerly in use served as prototypes; but later, cast iron pots, adjusted to the hearth, came into use. This mode of process soon became generally accepted and adopted, though many kept up the plan of distilling pitch in standing or lying alembics of sheet iron.

Although the pitch industry is almost exclusively in the hands of peasants, it should be none the less remarked that a gradual improvement has been made in all technical points; in the construction of apparatus and condensers, as well as in conducting the process itself, and in the use of accessory products, particularly charcoal. It may with truth be asserted that, unaided the peasants have themselves made all these improvements, since the pitch industry has received but little attention from the technicists.

The tar industry is already a pure Russian industry and has been put on a still firmer and more independent footing. The thin upper layer of pitch bark is peeled off the trees that are still standing or have been cut down, and by means of a short-timed distillation in the simplest of apparatus; namely in pits, are made to yield pure tar that is to be distinguished from pitch by a complete absence of turpentine, by its containing much less creosote and considerably more paraffine. In consequence of birch bark having become dearer, pure tar can no longer be used in smearing hides for home needs, and the peasants have devised a substitute in the so-called half-tar, which in its outward look and form differs but slightly from tar, and is obtained by distilling pitch with the mixture of a certain quantity of birch bark and aspen bark. This product has during the last thirty years passed into general use in the forest districts of central Russia, whence half-tar, of all pitch products the most in demand, is sent to the steppes, and particularly to the Don provinces, where it is simply called tar.

It is very difficult to give exact statistical returns of Russian pitch products; but, supposing the forests to yield yearly about 4,000,000 pouds of pure and half-tar, about 2,000,000 pouds of resin, 150,000 pouds of pitch, and 60,000 pouds of turpentine, the sum of the whole yield, including the charcoal obtained during the different processes, will amount to not less than 8,000,000 roubles. In this industry are used yearly about 320,000 cubic sogenes of resin, about 100,000 cubic sogenes of wood, and 2,000,000 pouds of birch bark, to obtain which 200,000 cubic sogenes of birchwood are required, so that in all 600,000 cubic sogenes of ligneous materials are used, that is, nearly the annual growth of 1,000,000 dessiatines of forest timber.

### L U M B E R T R A D E .

The home lumber trade of Russia is, of course, very extensive, but no kind of register is kept, and consequently its turnovers, as well as the sum expended on its transport, cannot be tabulated with any certainty. In reference to the timber trade abroad, data are furnished by the Excise Department, and its returns for the last four years are drawn up below in the form of tables. The Surveys of Foreign Trade, issued yearly by the Ministry of Finance, contain no information as to the quantity of lumber imported into Russia. Therefore, a somewhat unsatisfactory mode of calculation must be adopted. Having first determined by the table the average price of one poud of wood, plank, and building lumber exported from Russia (32½ kopecks), it must be assumed that the average price of timber materials imported into Russia is the same. In this way the result comes out that the quantity of imported lumber amounts to 11,366,000 pouds.

From the following tables it appears that Russia exports on an average 141,000,000 pouds of lumber, to the sum of 48,000,000 roubles, and imports 12,500,000 pouds to the sum of 5,500,000 roubles. The exports, therefore, exceed the imports by 118,500,000 pouds, to the sum of 42,500,000 roubles.

### P E A T A N D P E A T C U L T U R E .

The surface of European Russia, in relation to soil conditions, is divided into two tracts, the non-black earth, and the black-earth or Chernoziom. From their prevailing vegetation the first may be called the forest region, and the second the steppe region, although the boundary line between forest and steppe does not coincide in all cases with the northern boundary of the black-earth tract.

In complete harmony and adaptation with these two tracts are the two leading types, recognized as such throughout Western Europe, of peat bogs; on the one hand, meadow, river, or low under-water bogs; on the other hand, high pine forest bogs, cluckvaberry-bearing bogs, or moss-covered bogs. Naturally, there exist no sharply defined geographical boundaries between these two types, since the formation of turf-moor of this or that type depends chiefly on the composition of the water that feeds the bog, and which is not always of a different quality in the two tracts.

But none the less are seen, with rare exceptions, meadow turf-moors only in the southern Chernoziom region, which, in general is poor in bogs; whilst in the northern non-Chernoziom tract, pine forest turf-moors predominate, though here and there along the banks of rivers almost exclusively turf-moors of the first type are found.

The cause of this distribution of turf-moors will be understood if the salient and dominant composition of the surface formation in these two tracts or divisions of Russia be taken into consideration.

In the north the soil is mainly formed of copple sand, argil, and clay, all of which sorts are characterized by a poverty of soluble salts. Consequently, the atmospheric waters which flow across or along these strata and feed their lakes, rivers, and bogs, are generally poor in those salts which would prevent the growth of peat moss (*sphagnum*) and hinder the formation of a peat bog. Only along the banks of rivers, where the current streams constantly supply the bog with new and fresh qualities of salt is it impossible for peat bogs to form.

## Export of Lumber Materials from Russia.

	1888.		1889.		1890.		1891.	
	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.
Building lumber.	38,115,000	9,796,000	56,521,000	15,461,000	—	15,466,000	—	10,268,000
Sawed "	7,219,000	3,434,000	8,331,000	4,079,000	440,000	4,249,000	204,000	4,038,000
Plank "	75,186,000	25,304,000	87,146,000	35,760,000	—	32,589,000	—	28,858,000
Wood "	4,388,000	465,000	4,289,000	484,000	—	405,000	—	511,000
Wood materials "	1,627,600	1,343,300	1,730,700	1,446,000	2,047,430	1,691,100	1,632,400	1,387,000
Total	126,525,600	40,343,300	158,017,700	57,230,000	2,487,430	54,700,100	1,836,400	45,082,000

## Import of Lumber Materials into Russia.

	1888.		1889.		1890.		1891.	
	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.	Pounds.	Roubles.
Lumber materials, not especially named	—	3,904,000	—	4,542,000	—	4,689,000	—	4,259,000
Wood of the more val- uable kinds	336,000	420,000	262,000	430,000	352,000	568,000	16,000	391,000
Rosin, colophany, pitch.	1,110,000	1,176,000	1,037,000	1,034,000	1,311,000	1,383,000	191,000	182,000
Turpentine	15,000	57,000	23,000	90,000	21,000	97,000	23,000	106,000
Total	1,461,000	5,557,000	1,322,000	6,096,000	1,684,000	6,737,000	230,000	4,938,000

In the south, in the Chernoziom tract, the strata principally serving as a subsoil to the black-earth are composed of argillaceous schist, clay, limestone, and chalk, strata distinguished by a considerable presence of soluble salts. These salts, perpetually washed away by atmospheric waters and piled up in places in such quantities that they actually form salt marshes, which are so widely spread in the steppe governments of Russia, effectually prevent the formation of peat bogs.

On the other hand, the uniformly level surface of the steppe tract, with its slight declinations to river courses, does not, with the exception of river valleys, present conditions favourable to the formation of stagnant water tracts, and where these conditions exist on the level steppe, salt lakes, salt marshes, and even sometimes meadow bogs, though always covering a very small extent, will be formed.

In the non-Chernoziom tract, on the contrary, the surface elevation is not so uniform. Here are the characteristic undulations of a sea landscape abound, surrounded by hills and small watersheds, with its slight declinations, that are always filled with lakes, newly formed bogs and turf-moors, and tracts of originally dry land that are being gradually transformed into bogs. The abundance of sediments, together with the equal abundance, at least in earlier times, of forest land, that great preserver of moisture, has also greatly contributed to the spread of turf-moors in the north, whilst in the south there are fewer forests and less moisture, and consequently there must be less bogland.

Pine forest or moss turfmoors, which predominate in the non-Chernoziom tract, are principally to be found on high levels. These turf-moors are not irrigated by river water, which carries with it its mineral substances; for this reason the peat has no foreign admixture to increase the quantity of ashes, and to deteriorate its quality. The winds, which are so prevalent in forestless places and constantly carrying dry substances to considerable distances, do not exercise any great influence on forest districts, and do not supply the peat with mineral substances in any large quantity.

Moss or pine forest turf-moors which, as in Western Europe, are composed of different kinds of moss, *sphagnum*, with a mixture of sedge vegetation (*cyperaceae*), heather (*ericaceae*), and clukva (*vacciniae*), contain but a small quantity of ashes and are excessively homogeneous in character. The larger quantity of peat in these parts is indeed so homogeneous that even when subjected to microscopic analysis it is very difficult to distinguish the different sorts of vegetation of which it is composed. Peat of this kind when wet is known under the name of resinous peat, and is very much like tar; but when dry, it almost entirely ceases to imbibe water, assumes a solid form, is bright and sparkling when cut, and can even be worked on a turning lathe.

This resinous peat has its layer somewhat deep, but not at the very bottom, where the peat is generally composed of sedge and herb vegetations that are with difficulty decomposed. The depth at which it lies is less in proportion as the peat is drier, and in very deep bogs, resinous peat is not to be found even in the deepest layers, whilst in the drier turf-moors it is often to be found at a depth of not more than one arshine.

Moss turf-moors are either altogether forestless, or covered with poor pine trees, whose stems are crooked, stunted, and sometimes twisted into a special shape, but nevertheless bearing fruit. Occasionally the pines are mixed with birches.

Pines and birches are to be met with on the very peat, but this is exceptional, in which case the former are generally in such good condition that they are used for fueling railroad engines, whilst of the latter nothing remains except their white bark.

Turf-moors in the non-Chernoziom tract stretch over enormous distances, one stretch often extending over 300 square versts and more, as for example, in the high level of the eastern tributaries of the Oka and the western tributaries of the Kliasma, where they embrace the contiguous portions of the Moscow, Vladimir and Riazan governments. The Petersburg, Olonetsk, Novgorod, Tver, Yaroslav and Vologod governments are also famous for their numerous and large turf-moors. It may also be mentioned that the Kaninsk and Tiemansk fens in the Archangel government, for the most part, are composed exclusively of turf-moors.

In the black-earth tract moss turf-moors are but occasionally met with, and then only in sandy regions, on the shores of rivers, but not irrigated by their waters; as for instance, the vale of Lopan, fifteen versts to the north of Kharkov, in the Khrenovsk pine stretch of the Bobrov district, and near Voronezh.

As far as is known at the present day, the formation of turf-moors does not go deeper than 4 sagenes; and it is very seldom that a depth of this extent is to be found.

The contents of ashes and hydroscopic water in forest pine peat, collected from different places and dried in the air, may be seen in the following table:

Locality		Water.	Ashes.
		Per cent.	
Petersburg government, Petersburg district, Sestrortsksk . . .		9	2·9
" " Schlusselburg district, Iriinovka . . .		9	2·5
" " Tsarsko Selo, Chertenovsk-lake . . .		9	2·50
Vladimir " Pokrov district, Procoutine pinery . . . .		9·56	3·67
Kharkov " Kharkov district, Dergatchi . . . .		11·29	3·90
" " " " " . . . .		—	4·69
Voronezh " Voronezh district, Umansk . . . .		11·9	3·90
" " " " Lebiyazhe . . . .		13·7	2·13

The proportion of ashes changes but slightly with the depth, and no essential change is to be observed unless there is also a change in the vegetable composition of the peat. The elementary composition of peat changes with the depth in a far more marked manner. Thus in the peat of the Koudyken fen, in the Pokrov district of the Vladimir government, dried at 100° C., was found:

	C.	H.	O.	N.	Ashes.
At a depth of 30 centimetres . . . .	53·4	5·95	34·75	1·3	4·6
" " 1·5 metres . . . .	55·6	5·6	32·7	1·4	4·7
" " 2 metres . . . .	59·1	5·5	28·5	1·7	5·2

If, however, pine forest turfs, taken from quite different localities and at different depths, differ so little, which is to be explained by the uniformity in their herbal composition and the absence of foreign admixtures, meadow turfs, on the contrary, if formed from different sorts of vegetation and under different conditions, will differ one from the other in diametrically opposite properties. These peats are generally formed

on such places as are temporarily flooded and have interlayers of mineral deposits reaching sometimes one arshin thick, and even more, or they are impregnated with compounds of lime and iron which give the peat a white colour (sulphate and carbonate of lime), or a red colour (peroxide of iron), or a blue (vivianite, phosphate of iron); or they contain conglomerate fresh water shells, siliceous crustacea, diatomous sea-weeds et cetera.

The vegetative substance of subaqueous turfs most frequently consists of the roots and stems, well preserved and twisted into a compact ball, of water and marsh sedges (*carex*, *scirpus*) and herbs (*phragmites*, *glyceria*, *phalaris*, *calamagrostis*), with a more or less pronounced mixture of the roots of other plants (*comarum*, *lysimachia*, *equisetum*, *menyanthes*). Less often are found turfs composed of mosses of the *polytrichum* and *hypnum* families, or formed of wood vegetation, chiefly of alder with aspen and birch.

Subaqueous or meadow peat is to be found in all parts of Russia, but particularly on the shores of the Pripet and its tributaries in the wide stretching bog district known under the name of Polessie. The low level of the locality and its too slight declination do not allow the Pripet to empty in time into the Dnieper the overflow of water poured into it by its tributaries from the north and south. The water is thus checked in its course, and all the conditions become favourable for the formation of turf-moors. In the black-earth tract, as has already been remarked, the dominant type is also subaqueous meadow turf-moor.

The proportionate quantity of ashes in this second type of turfs varies to a very great extent, as the following tables will show, and depends principally on the composition of the water, and the purity of the turf, that is, the absence of all foreign admixture conveyed by the water or wind. If the rich proportion of ashes contained in some of these turfs be considered, they may more truly be classed among the vegetable earths.

Locality						Water. Per cent.	Ashes.
Tambov government	Morshansk distr.,	Kouliky (sedge turf)	on the surface			14·94	8·01
"	"	"	"	"	" at 1 arsh. depth	12·26	9·66
"	"	"	"	"	" at the bottom	14·06	10·74
Voronezh		Voronezh distr., Gravskaya	(turf of grass, sedge jungle).			17·79	9·99
Petersburg		Tsarsko Selo distr., Souida	(forest bog) . . . . .			17·6	8·9
Vitebsk		Dviensk distr. (jungle, sedge, grass).	. . . . .			16·4	9·8
Koursk		Koursk distr., Boukrievka	(sedge and grass) . . .			13·48	11·26
Riazan		Zaraisk distr. (sedge turf, "titmouse").	. . . . .			10·90	11·30
Chernigov		Niezhinsk distr., Troubailo	(hypnum and sedge). .			14·46	16·18
Petersburg		Yamburg distr., Courovitz	(polytrichum, sedge and grass) . . . . .			11·60	17·46
Poltava		Loubensk distr. (riverside, with mussels)	. . . . .			13·4	27·39
Voronezh		Voronezh distr. Bobiakine	(hypnum) . . . . .			10·9	28·04
Tambov		Borissogliebsk distr. (aldern turf)	. . . . .			5·22	64·71
Poltava		Constantinograd distr., Pereschepino	(brinish). .			4·1	74·56

Ashes of the vivianite turf from the Koursk government have the following constituent ingredients:

Charcoal and hydroscopic water . . . . .	9·23
Potash, $K_2O$ . . . . .	0·76
Natron, $Na_2O$ . . . . .	0·25
Magnesia, $MgO$ . . . . .	0·60
Lime, $CaO$ . . . . .	2·52
Aluminum, $Al_2O_3$ . . . . .	0·53
Sesquioxide of iron, $Fe_2O_3$ . . . . .	50·32
Oxide of manganese, $Mn_2O_3$ . . . . .	0·06
Phosphoric oxide, $P_2O_5$ . . . . .	30·20
Sulphuric oxide, $SO_3$ . . . . .	0·56
Silica, $SiO_2$ . . . . .	5·24
	100·27

The general proportion of ashes in this turf was 25·84 per cent of which about 22 per cent go in dry vivianite. After having been thoroughly boiled with acid the mineral layer of this same peat contained 70·36 per cent of carbonate of lime,  $CaCO_2$ .

The peat beds in Russia have been only lately utilized, although already in the last century the Government took measures towards making peat working more general. The abundance of wood in the forest zone and the old custom in the south of using other wood fibre, straw, and fuel prepared from manure, hindered the success of the Government enterprise. Even the experiment of distributing peat free of charge, tried by the Ministry of Crown Domains, about 1840, failed to convince the people of the advantages of using this new kind of fuel, and it was only taken up by the inhabitants of the Baltic provinces.

Shortly before 1870 when, in consequence of the increased number of factories and the extension of railways, the price of wood rose, some mills introduced peat fuel, especially in the governments of Moscow, Vladimir and Tambov. The most considerable of these works was the Nikolsk Manufacturing Company situated in the government of Vladimir near the borders of the government of Moscow; this company works 36,000 cubic fathoms or 8,750,000 pouds of peat per annum.

After the works had started winning peat in response to the invitation of the peasants to work the marshes, this kind of fuel began to find favour with the peasantry and is now often seen in their cottages.

One of the most important measures taken during the last twenty years for developing the peat working industry was the establishment of Government peat works in the year 1874 in the government of Orel. Here various methods of working peat were investigated and those desirous of learning the business were duly instructed. The peat from these works was used as fuel on one of the tracts of the Orel-Vitebsk Railway. These works were closed in 1883. In this same year the Ministry of Crown Domains organized in the neighbourhood of Moscow an exhibition of the products of the peat industry and a competition of machinery and appliances, in which foreign exhibitors also took part. In addition to this the Ministry having instituted a separate department of specialists in peat working, commenced a systematic investigation of the peat beds,

especially those situated along the railway lines with the view of letting them out on lease, gave full instructions concerning the methods of working them to private individuals and institutions, and has quite lately taken measures towards using peat bedding.

At present peat is made into fuel principally in the governments of Moscow, Vladimir, Nizhni-Novgorod, Tambov and Voronezh and also in the governments of Riazan, Koursk, Orel, Chernigov and those by the Vistula and the Baltic provinces.

The yearly output is shown in the following figures:

Central governments . . . . .	155,000	cubic sagenes.
Northern and mean Chernoziom . . . .	60,000	" "
Western and north-western . . . . .	25,000	" "
Various . . . . .	20,000	" "
Total . . . . .		260,000 cubic sagenes.

Taking the average weight of 1 cubic sagene of dry peat at 200 pouds, the yearly output is equal to 52,000,000 pouds. The quantity used for litter and antiseptic purposes is very small, as it has been but lately applied to these uses.

## CHAPTER XVI.

**Goods freights in conjunction with transport statistics.**

Russian legislation concerning railway freights and Government regulations in the tariff department; the actual freights charged by the Russian railways and the quantity of the principal agricultural, lumber and metallic goods conveyed; transport and freights upon the inland water ways of European Russia.

**I**N matters of tariff the Russian railway companies have never, legally speaking, been endowed with unlimited liberty. When these companies were first established their power of fixing rates for the transport of passengers and goods was to a certain extent controlled by the nomination of the so-called limiting or statute tariffs which are still in force on the private railway lines. These limiting statutes were already published in 1857 in a treatise concerning the fundamental clauses for building the first network of railways in Russia and were then entered into the statutes of the Chief Company of Russian Railways in 1861, and into the regulations of nearly all the other railway companies. These limiting rates were fixed in the following proportions: 1. First class passengers at 3 kopecks per verst, second class passengers  $2\frac{1}{4}$  kopecks, and third class at  $1\frac{1}{4}$ , with an allowance of 1 poud of free luggage for each passenger, extra luggage being charged at the rate of  $\frac{1}{20}$  kopeck per verst for every 10 pounds, counting anything under this weight as 10 pounds; 2. at 3 kopecks per head per verst for working cattle, such as oxen, cows, bulls, horses and mules; 1 kopeck for calves and swine,  $\frac{1}{2}$  a kopeck for rams, sheep, lambs, goats and dogs. For slow goods trains, three maximum rates were fixed according to the three classes of goods circulated in trade, namely, first class goods  $\frac{1}{12}$  of a kopeck, second class goods  $\frac{1}{18}$ , and third class goods  $\frac{1}{24}$  of a kopeck. The goods enumerated, however, only include 130 denominations and this is not by any means a complete list of the articles transported by the Russian railroads. The first class includes 52 varieties: iron and lead wares, copper, cast iron, metals both wrought and unwrought, cotton yarn, woollen goods, foreign linen, wine, tea, coffee, sugar, drugs and colonial merchandise, manufactured goods, mirrors, tobacco and certain other more costly goods. The second class is made up of 44 articles such as, ores, charcoal, cotton, building timber, pig iron, bar and sheet iron, lead in pigs, flax, hemp, cloth and linen made in Russia et cetera. The third class consists of all kinds of corn, flour, vegetables, salt, pressed and packed hay, tow, rags, lime, wood, stone, sand, clay, coke, coal et cetera, 34 varieties in all. Goods not mentioned in any of these three classes must be assigned to the one having the most analogy to them. These limiting rates refer to slow goods trains for distances less than 200 versts. For longer distances the freights are lowered in the following proportion:

10 per cent for distances between 200 and 500 versts, 15 per cent between 500 and 1,000 versts and 20 per cent for distances over 1,000 versts, on condition, however, that the amount charged be not less than that taken for a shorter distance.

The rate for goods conveyed at the speed of passenger trains is  $\frac{1}{6}$  of a kopeck per poud-verst.

In some of the later statutes of railway companies in addition to the limiting maximum tariffs, there are also fixed minimum rates for conveying goods.

Lastly, besides the limiting tariffs according to classes, the statutes of nearly all the railway companies have special low rates, on one line as low as  $\frac{1}{65}$  of a kopeck per poud-verst, for such goods as ores, salt, manure, mineral fuel, et cetera. In addition to limiting tariffs, the statutes of the Chief Company and most of the later railways contain other restrictions which the companies are bound to respect, when fixing and altering the tariffs, and in virtue of which they are bound in certain cases to present their new propositions to be sanctioned and approved by the Government. These regulations were generally too indefinite and incomplete and the duty of seeing them carried out generally devolved upon the Ministry of Ways of Communication, where no special department was established for this purpose. The actual state of things was therefore that the railway companies fixed freights for the greater part of the goods below the limiting rates, which were made too high, and regulated their tariffs quite independently, acting entirely according to their own interests, without considering the interests of the other lines or the requirements of trade or the Government, and without any control or direction of the State.

The natural consequences of this system were soon apparent. At the end of the seventh decade the tariffs of the Russian railways were already in such a state that they elicited universal complaint and discontent from those private individuals and establishments whose interests depended upon railway rates which were then characterized by the utmost diversity, complexity, instability and inequality. There were normal, local, special, differential tariffs, and tariffs of direct communication within the limits of one group, specially arranged tariffs between two or more lines or groups, and finally a mass of exceptional, explanatory, supplementary and modifying paragraphs. Hence arose such complication of the accounts of the lines, both with those who forwarded the goods and with other lines, that not only the public, but even the railway agents themselves, had the utmost difficulty in disentangling the confusion, and they constantly fell into errors which resulted in mutual recrimination, complaints and disputes. The extreme instability of the railway rates, the arbitrary changes made with a total absence of regular or timely publication and unjust advantages and discounts made to favoured individuals, caused enormous losses in trade and industry and prevented business from being carried on upon the basis of true economical computations. The competition between railway lines in many cases resulted in an excessive diminution of rates which, in other cases were, on the contrary, far too high, compared with the value of the goods. In this manner an irregularity of rates was created for various industrial centres and even for separate industries which had a most injurious influence upon trade and commerce and caused great loss to the State, which guarantees a certain mean income to most Russian railways. Besides this, the system of basing the tariffs upon the sole commercial advantages of joint-stock companies led to the consequence of often paralizing the activity of various Government measures directed towards the encouragement and protection of native industry.

The question of the necessity of a total reform in railway tariffs and a constant Government control over them arose already before 1880. The Commission under the presidency of Count Baranov, after having investigated railway routine, also gave serious consideration to this question and exposed its principal, essential deficiencies. The practical measures taken by the Government towards revising the tariffs were, however, at the commencement marked by their great discretion. In 1881 a law was passed ordering all railway companies to submit all their fixed tariffs and proposed alterations to the Ministries of Finance, and Ways of Communication, and to the State Control. In 1883 the highest general scales of supplementary dues were fixed and an obligatory nomenclature with an alphabetical list of goods was introduced on all railways. In 1885 the General Statute of Russian Railways was issued, which is in force up to the present time; it however only contains the few following general rules, referring to tariffs and supplementary dues. According to paragraph 68 of this statute the carriage and supplementary dues must be calculated according to the legally published tariffs and regulations concerning supplementary dues. According to paragraph 71 all departures from the rules and exclusive advantages or preferences in favour of any separate parties are strictly forbidden. Paragraph 72 forbids any excess charges above the fixed tariffs, and enacts that any excess charges which are unclaimed by the sender before the lapse of a year, shall be handed over to the State.

In 1886 the tariffs for direct communication with foreign countries were subjected to Government control and sanction. All these separate measures did not, however, bring about the desired result of regulating the tariff department of Russian railways. In 1887, therefore, the Council of the Empire, upon examining this question, recognized that it devolved upon the Government to take the direction of the actions of the railway companies in fixing tariffs with the view of safeguarding the interests of the population, trade, industry and the State, and commissioned the ministers of Ways of Communication, Crown Domains, Finance, and the State Control, to work out the best means of accomplishing a Government inspection of railway tariffs. In pursuance of this, from March 8, 1889, a new special law was promulgated and enforced concerning railway tariffs and institutions connected with tariff matters and not only were definite regulations fixed and the mode of action of the Government in railway tariff matters laid down, but besides this, special departments were established in the Ministry of Finance for reforming the tariffs and then gradually assuming the direction of tariff matters. The system of Government inspection and supervision of tariffs in Russia in vogue at the present time is based upon this law and the regulations issued during its further development.

The following is in general terms an exposition of this system. The tariffs of all Russian railways open to the public, whether owned by the State or by private individuals, are subjected to Government supervision and guidance. By the word tariff is not only meant the payment for carriage but also all supplementary and other dues levied by the railway lines and the regulations applying to these rates and dues. The direction of the Government is enforced in: a. determining the basis of the tariffs; b. in fixing rules for composition, introduction, application and alterations of tariffs; c. in enforcing the strict observance of these rates and rules, and in removing any departures from them which may be discovered; d. in observing that the tariffs are in accordance with the interests of the public, trade, industry and the State; e. in resolving the question concerning the distribution of rates and other dues amongst the

railways, to abolish competition and mutual agreements between railway lines or other modes of transport and likewise between private companies and individuals in those paragraphs of the agreements concerning tariffs and the conveyance of passengers and goods. Propositions concerning changes in or additions to the actual tariffs and also concerning the establishment of new tariffs are schemed by the railway companies or meetings of their representatives, but cannot be enforced without having previously been examined by the Government tariff department.

All propositions referring to tariffs are presented to the Ministry of Finance, with a full explanation of their basis, and it depends upon the Ministry to suspend the application of the new tariff, or even to veto it altogether. If in the course of six weeks the Ministry does not present any obstacles to applying the new tariff it may be enforced in just the same way as if the Ministry had notified its consent. If the introduction of a new or any alteration in an existing tariff is necessitated by the interests of the public, trade, industry or the State, the question may be agitated outside the railways, by competent Government or public institutions and by societies having a statute confirmed by the Government whose duty is to watch over the economic interests of the population and to satisfy the wants of trade and industry. Questions agitated in this manner, if the Minister of Finance considers it necessary to give them further impulse, are handed over for preparatory consideration to those railways to which they refer, or in case of necessity, to a meeting of their representatives; however, should the railways omit to send any report by the required time, this will not prevent the question from receiving further consideration. The railways are bound to adopt the decisions of the Government tariff institutions on all questions of rates.

No new rates can be introduced otherwise than in strict accordance with the regulations concerning the composition, publication, introduction and annulment of tariffs. The railway lines and meetings of their representatives are bound to supply the Ministry of Finance with all statistical and other data in their possession, required for the solution of tariff questions and also to exhibit to persons appointed by the ministry all books and documents required for checking the action of railway lines in connection with rates.

Such are the elements of the system of Government supervision and inspection of Russian railway tariffs based upon the law of March 8, 1889. All this business is managed by three institutions attached to the Ministry of Finance, namely, a Tariff Council, a Tariff Committee and the Department of Railway Affairs.

The Tariff Council, being the highest, is destined for the solution of the most important and general questions on rates. It is presided over by the Minister of Finance and consists of his assistant, the directors of the departments of railway affairs and of trade and manufactures, of two members from the Ministry of Ways of Communication, of one member from each of the other Ministries, three representatives of agricultural industry, two representatives of trade and manufactures, one representative of the mining industry and three representatives of private railway companies. The Council has under its jurisdiction: the forming of regulations concerning the composition, publication, introduction and annulment of tariffs, together with fixing the time of their observance; the establishment of rules for composing, editing and presenting tariff statistics of the conveyance of passengers and goods; fixing rules for meetings of representatives of railways upon questions of tariff; the indication of general means for avoiding competition be-

tween railways and other means of transport and also the distribution of railway dues among them; the consideration of propositions referring to the limiting rates of transport charges and the determination of supplementary and other dues. Besides all these questions some private questions connected with tariffs are in certain cases submitted to the Council.

The Tariff Committee is presided over by the director of the Department of Railway Affairs, and consists of two members from the Ministry of Finance and one from the Ministries of Ways of Communication, Interior, Crown Domains and State Control. Representatives of separate railway lines may be invited to the committee meetings to give explanations, and also delegates from meetings of the representatives of railways or indeed any private individuals who might be expected to give useful information upon the questions being discussed. The committee therefore decides the most important private tariff questions which are directly connected with the requirements of the public and the wants of industry and trade. The less important questions are passed over to be examined by the Committee of the Ministry of Finance or brought before it in pursuance of the opinion of the director of the Department of Railway Affairs. All business in the Committee is decided by a simple majority of votes and the decisions are enforced if they are not stopped by the Minister in order to put the matter before the consideration of the Tariff Council.

The Department of Railway Affairs has the control over all matters concerning railway rates and other matters referring to railways within the jurisdiction of the Ministry of Finance. With regard to the tariff department, besides the expedition of the business of the Council and Committee and their dealings with various departments, railways, meetings, private companies and individuals, this Department is required to examine and consider the propositions of the railway companies and their meetings concerning alterations in the actual tariffs and the questions about tariffs agitated by Government and public institutions; to collect information and data on tariff matters and to obtain it from the railways to investigate and work out questions having the purpose of suiting the tariffs to the interests of the public, trade, industry and the State, and also to augment the revenues of the railway lines; to decide private questions about the distribution of freight rates amongst the railway lines in direct communication tariffs; to decide those private questions which do not come within the jurisdiction of the tariff Committee; to notify to the railways any new tariff regulations; to supervise the strict observance of the tariff rates and the rules referring to their composition, introduction, application and annulment.

The decrees of the Government tariff institutions, which are not in accordance with the existing regulations, may be appealed against to the Minister of Finance, if they have been confirmed by the Department of Railway Affairs, or to the Tariff Committee, and to the Senate if the decree has been confirmed by the Minister or the Tariff Council.

Soon after the new tariff institutions commenced operations, some opposition was encountered from certain railways against the endeavours of these institutions to bring the tariffs then in force to suit the general good, and the powers granted to them by the law of March 8, 1889, were found to be insufficient to crush this opposition. Hence on August 12, 1889, a supplementary law was issued providing for such cases when any railway line or meeting of the representatives of railway lines should not present

within the term specified by the Ministry of Finance the scheme of tariffs demanded of them, or should fail to publish the tariff fixed in the legal manner. Should the Minister decide in such cases that the introduction of a new tariff or any changes in the actual one are required in the interests of the public, trade, industry or the State, then the computation of such a tariff devolves upon the Department of Railway Affairs. The Tariff Committee then ratifies these tariffs and the conditions under which they shall be applied in due legal order and the Minister presents them to the Senate to be published in the "Collection of Government Decrees and Orders". The tariffs compiled and published in this manner are obligatory both for the railway lines and the individuals who make use of them.

Such are the organization and powers of the tariff institutions established in 1889 in connection with the Ministry of Finance with the view of reforming the tariff department of the Russian railway lines, of introducing order and system into this branch of railway business and constantly watching that the scale of railway rates is consistent with the interests of all parties concerned. All measures taken up to the present time by the tariff institutions may be divided into two groups. One category of these measures is marked by what may be termed an organizing character and is destined to put the matter under such conditions which would ensure its regular progress and enable the Government to excercise the requisite control and supervision over railway tariffs.

Among other measures of this kind may be mentioned the organization of certain auxiliary agents such as the publication of the "Tariff Magazine", a statistical section of the general meetings of the railroad representatives et cetera, and the fixing of some general rules which determine the various branches of business connected with railway rates.

The other sphere of action of the Government tariff institutions was directed towards the direct solution of those problems dealing with the regulation of tariffs, supervising them and directing the actions of the railway companies in this business. First comes the work of revising and regulating the tariffs of separate lines and groups of railways and in simplifying and assimilating the rates for the most important goods over the entire network of Russian railways. Besides this, of course current business concerning tariffs is transacted, and a sharp lookout is kept that the acting tariffs are carefully observed. The conditions of national economy are carefully studied, also the movements of freights and passengers and other such questions of first importance in dealing with railway tariffs.

One of the first administrative measures taken by the Ministry of Finance was the issuing of rules referring to the composition, publication, introduction and alteration of rates. The duties of the railways towards the State and towards the public are set forth with such fullness and exactitude that the railways have no possibility of evading the Government control or acting arbitrarily towards the public.

The timely publication of a tariff for general information is absolutely necessary for its being enforced. This publication must be made in a special periodical called the "Magazine of Russian Railway Tariff", which is published twice a week. Up to January 1, 1893, it was published at the general association of railway representatives but after this date it is published by the Department of Railway Affairs.

Measures were then taken for the regular basing of railroad tariff statistics, and

for periodically presenting data of that kind to the Ministry of Finance. For this purpose a special statistical section was organized at the general association of railroad representatives and exact rules were taught for compiling, publishing and presenting statistics referring to the conveyance of passengers and goods. By these rules the railway company is bound to keep: 1. complete statistics of the conveyance and receipts of passenger, troupes and goods traffic; 2. to record the statistics of the transport of goods according to a special nomenclature, so as to be enabled to give in good time all necessary information for working out rates.

It has already been stated that the competition between different railroads was one of the principal causes of the disorder and disagreement in railway rates. In order to avoid this the tariff institutions compiled general bases, which were confirmed by the council and issued in the form of special rules made obligatory and introduced on all railroads from March 16, 1890. These regulations comprised the following: a. the institution in various directions of equal or corresponding tariffs; b. a corresponding distribution of freights in one or another direction; c. a corresponding distribution between competing lines of the direction and receipts for conveying goods in one or another direction. The extent and order of the application of these rules must be determined from the united conditions of transport in one or another direction and should correspond to the degree of efficiency of each separate direction in actually accomplishing the transport, taking into consideration the extent of the competing directions and the advantages of transporting goods by them which might accrue to the interest of the public, industry, trade and the State, and also the relation between the quantity of conveyances and number of managements and the distributions of lines over these directions.

In the absence of Government control over the tariffs, the railway economy suffered, amongst other things, from an irregular and unjustly founded distribution of charges for conveying goods by direct communication between separate lines. Some railways, taking advantage of their geographical position, advanced most unjust, pretentious and exaggerated demands concerning their share of the general receipts for direct transport. This question engrossed the attention of the tariff institution as soon as they commenced operations. The rules issued in 1889 were, however, superseded by new ones in 1891, which determined that the share of each line should be proportional to the distance the freight had travelled along it. The only exception to this was in case the distance travelled should be less than 120 versts.

For the transport of wheat and also coal, anthracite, coke and coal briquettes, a premium was granted in the following terms: should the distance the goods were conveyed be under 70 versts, the carriage is computed according to the limiting tariff of the line for the distance travelled, but not higher than  $\frac{1}{24}$  kopeck per poud-verst for wheat freights and  $\frac{1}{55}$  kopeck for the other goods mentioned; should the distance exceed 70 versts, the carriage for the first 70 is calculated in the manner just described and the extra distance is paid out of the remainder of the general carriage payment, proportionally to the distance travelled, even should the total distance along the line from which they were despatched be less than 120 versts.

These departures from the general principles of the distribution of rates in proportion to the distances the goods were conveyed were only temporarily admitted because it did not seem advisable at once to alter the former distribution system completely in accordance with the general principles before stated. In April, 1893, new regulations

were issued, abolishing the premium of short distance lines and only reserving it for those lines from which wheat and coal freights were despatched.

It has been already mentioned that as early as in 1883 the Ministry of Ways of Communication issued a list of the highest scale of supplementary dues with the view of assimilating them. As this list, however, admitted variations according to the discernment of the railway lines, it soon proved unsatisfactory, and in 1891 it was therefore superseded by a new one in which the amount of all dues was fixed absolutely alike for all railroads. According to this list the following supplementary dues were fixed: the station expenses for freights at high and low speeds were fixed for the three classes of goods at 0·7, 0·4 and 0·2 kopecks per poud; for piece goods there was a special scale of dues; the invoices given by the railways are charged at one kopeck apiece; weighing costs 0·25 of a kopeck per poud, and 75 kopecks per car for goods loaded in bulk; for unloading and loading or reloading 0·33 of a kopeck per poud is charged. Besides this there are definite dues allowed for detention of cars, warehousing and transfer of payments. Apart from these supplementary dues a charge of  $\frac{1}{5}$  of a kopeck per poud is levied upon goods brought to the station and waiting to be conveyed; this is to provide means for warehousing them.

Finally, amongst the general administrative measures taken by the tariff institutions and having great importance, the regulations issued on November 27, 1890, concerning the meetings of railway representatives on tariff business are well worthy of mention.

Whilst revising the so-called import tariffs upon foreign merchandise, the tariff of the Nicholas Railway was taken as a basis and when these were set, the tariffs of other railway communications and also entire railway regions were regulated.

#### THE REVISION OF THE NICHOLAS RAILWAY TARIFF.

This was one of the first matters taken in hand by the tariff institutions. The former tariff introduced as early as 1864 already ceased to correspond with the new conditions and elicited many complaints. It essentially differed from those of the other lines. The nomenclature did not at all coincide with that established by the Ministry of Ways of Communication and used on all other lines. The unsatisfactory classification of goods led to great difficulties when it came to taxing goods not mentioned in it, and there were many complaints that goods had been accidentally put down to one class or another without sufficient consideration to the conditions of trade and commerce. The scheme of this tariff was quite different from that upon which those of the other lines were based: the goods were divided into 8 classes, from 50 to 15 kopecks per poud, for the whole distance between St. Petersburg and Moscow, and the carriage for the intermediate stations was calculated by a very complicated formula.

The necessity of revising the old tariff of the Nicholas Railway became more urgent on account of the particular importance of this line as uniting the two capitals of the Empire, and also from the fact that the direction from St. Petersburg to Moscow is the shortest route for conveying foreign goods to the Moscow market, the new tariff ought therefore to serve as a basis for regulating all import rates to Moscow through the other Baltic ports and western frontier stations. The new tariff was worked out in the following order: The Tariff Committee determined the principal bases of the scheme and all the details were worked out by a special commission of members of the Department, representatives

of the Chief Society of Russian Railways, of the St. Petersburg and Moscow Stock Exchange Committees, and other specialists in various branches of trade and industry, numbering 94 persons. The principal bases elaborated by the Tariff Committee were: firstly, in order to facilitate the delivery of articles of consumption, such as dairy produce, meat, fish, salt, vegetables et cetera, it was necessary to endeavour to lower the rates for the conveyance of such articles from the stations in the interior to the centres where they are consumed. Next, with the view of making the line pay better, it was deemed advisable to raise the tariffs on more costly goods both of Russian and of foreign extraction. Finally in order to bring the Nicholas Railway tariff into the same shape as the others it was determined that the nomenclature and tariff scheme adopted in the new from should be the same as generally used upon all lines, expressed in simple fractions with known percentage of discount from the schedule rate for increased distances of transport.

The tariff at present in use on the Nicholas Railway was compiled upon these principles. According to it the rate charged for the transport of goods at high speeds is, on post trains  $\frac{1}{5}$  kopeck per poud-verst, and on passenger trains  $\frac{1}{6}$  kopeck, besides State supplementary dues. The carriage of goods at slow speeds is calculated according to the following eight poud-verst charges, specially fixed for each of the eight normal classes into which all kinds of merchandise was divided: I class  $\frac{1}{10}$  kopeck, II class  $\frac{1}{12}$  kopeck, III class  $\frac{1}{15}$  kopeck, IV class  $\frac{1}{18}$  kopeck, V class  $\frac{1}{24}$ , VI class  $\frac{1}{30}$ , VII class  $\frac{1}{36}$  and VIII class  $\frac{1}{40}$ . These rates are lowered 10 per cent for distances over 200 versts, and 15 per cent over 500 versts on condition that the charge for distances over 200 and 500 versts with discount shall not be less than the corresponding charge for a distance under 200 versts without discount, and 500 versts with 10 per cent discount; for certain goods special discount is allowed.

#### REVISION OF TARIFFS FOR GOODS BROUGHT FROM ABROAD.

Although the quantity of foreign goods imported into Russia is considerably less than the shipment of Russian goods abroad, it is nevertheless very large. The total value of the foreign goods imported in 1888 amounted to 351,254,000 roubles, in 1889 it rose to 394,657,000 roubles, and in 1890 it was 384,383,000 roubles. These totals may be subdivided as in the following table:

G o o d s .	1888.	1889.	1890.
	In thousands of roubles.		
Victuals . . . . .	54,695	58,881	62,671
Raw and half-finished material.	228,256	253,097	245,459
Animals . . . . .	1,162	1,037	1,048
Manufactured goods. . . . .	67,141	81,643	75,205

Naturally all foreign goods which arrive at the ports are not sent on by rail; part of them are consumed in large seaport centres like St. Petersburg, Odessa and Riga, and part are conveyed to the interior by water. There are no exact data on the transport of foreign goods by Russian railways, but the above mentioned figures of the foreign import into Russia lead to the conclusion that the amount conveyed by rail to the markets of the interior must be very considerable and therefore the just solution

of the question of import tariffs on these goods is of great importance to Russian industry in general.

The former tariffs for the transport of foreign merchandise, that is to say, the goods which entered the Empire through the Western land frontier and the ports of the Baltic, Black and Azov seas, were in most cases computed upon very low poud-verst rates, compared with those paid for the transport of Russian goods. This resulted from competition between the lines in trying to draw foreign goods, and also from the fact that they formed a return freight and filled the cars from which wheat, flax, hemp and other bulky goods, delivered at the ports for shipment abroad, had just been discharged. Such a state of affairs was, however, in direct opposition to the interests of Russian industry and the fundamental policy of the State Customs Department, which consisted in affording every protection to native industry. The tariff fixed by the railway lines weakened the effect of the protective duties and facilitated the competition between foreign and native goods. At the same time the excessively diminished rates on foreign goods decreased the revenues of the railways and occasioned direct loss to the State which guarantees the income of many of them. Besides facilitating foreign competition, the former import tariffs gave very palpable, but exceedingly unfair, advantages to the border industries, particularly to those in the Vistula and Baltic governments over those of Central Russia. The abolition of these advantages was all the more to be desired because the frontier manufacturers, already in virtue of their geographical position, possessed great facilities for obtaining foreign raw material, cotton, iron and fuel, and were in reality a semi-foreign or converting industry, whilst true Russian trade had been from time immemorial established in the central regions.

Apart from these defects, the import tariffs were also distinguished by many of the general failings of the old tariffs; there was the utmost variety and hazard made use of in fixing the rates, great diffusiveness in many parts and numerous supplements.

The general revision of import tariffs took place in 1890. The principal object it had in view was the abolition of the above mentioned advantages in favour of foreign and border industry, and to fix new tariffs of an even and uniform nature for the products of all parts of the Empire.

The new direct rates were composed on the following basis: First of all the so-called «fundamental import tariff» for a distance of 625 versts was elaborated. This determines the charge for the transport of goods from St. Petersburg, or rather from the New Port to Moscow, which distance was taken as 625 versts. The charges calculated according to the fundamental import tariff must not be less than those obtained by adding the charges for conveyance from the New Port to the St. Petersburg station of the Nicholas Railway, according to the rates of the port branch line, to the charges from St. Petersburg to Moscow, according to the local tariff of the line. The carriage of foreign goods from the Baltic, Black and Azov seaports to Moscow, with a distance of less than 1,000 versts, is obtained by adding to the charge for the 625 versts, calculated according to the fundamental import tariff, a payment for the extra distance travelled over the 625 versts, not less than  $\frac{1}{80}$  kopeck per poud-verst for I class freights,  $\frac{1}{100}$  kopeck for II, III, IV and V class, and  $\frac{1}{125}$  for VI, VII and VIII class goods. For distances over 1,000 versts an extra charge is made above that for the 1,000 versts, of not less than  $\frac{1}{100}$  kopeck per poud-verst for I class goods,  $\frac{1}{125}$  for II, III, IV and V class, and  $\frac{1}{150}$  kopeck for VI, VII and VIII class goods.

The freight rates, according to the direct import tariffs, to the stations beyond Moscow are composed of the rates on foreign goods from the ports or frontier stations to Moscow and of those from Moscow to the points of destination, reckoned according to the schedule for the interior. In case the distance from Moscow to the station of the interior is greater than that from the frontier to Moscow, the frontier - Moscow rates are reckoned for an equal distance beyond Moscow, and for the remaining distance the charges are made according to the interior schedule. The rates to the other stations of the Russian railways are reckoned on the same principle, as those from the frontier to Moscow.

In accordance with the revised import tariffs the following bases were adopted for the new freight rates on articles of local production carried from the seaports or western frontiers to the interior stations of the Empire: 1. The freight rates on such articles from the ports and frontier stations (loco-tariffs) are not to be less than those which, under the new import schedule, are charged by the Russian railways in direct communication with foreign lines for the transportation of foreign goods from the same ports and frontiers; the railways are to be given the right to raise these rates, provided they do not exceed those levied from the nearest foreign points which are under the schedule for the direct ways of communication. 2. The freight rates from the regions, lying close to the ports or frontier points, to the interior localities must be reckoned per poud-verst, and must not be less than the rates reckoned from the frontier stations loco.

The new rates based on the above mentioned principles went into force December 20, 1890.

According to the revision made in the system of the international import tariffs those of a whole series of separate direct lines, uniting two or more distant trade-manufacturing regions, were also revised.

#### REVIEW OF THE FREIGHT RATES OF THE RAILWAYS OF GROUP I.

The schedule and the classification of the import tariffs have been taken as a basis in the working out of the new tariff for this group including the following railways: Griaze-Tsaritsinsk, Dvina-Vitebsk, Kozlov-Voronezh-Rostov, Libau-Romny, Mitau, Moscow-Brest, Moscow-Kazan, Orel-Vitebsk, Orel-Griaze, Polessk, Pscov-Riga, Riga-Dvinsk, Riazhsk-Viazma, the Yelets district of the Syzran-Viazma, Riazan-Ural, St. Petersburg-Warsaw. Some of these railways enter also into Groups II and III.

Dependent on the reforms effected in the tariffs of separate routes and individual groups of lines enumerated above, the local rates of the following lines were likewise subjected to revision, these lines being principally connected with the Nicholas Railway, and with the systems of the Vistula and Baltic districts and with those under Group I, namely: St. Petersburg - Warsaw, Libau - Romny, South - Western, Dvina - Vitebsk, Orel - Vitebsk, Orel - Griaze, Moscow - Brest, Rybinsk - Bologoe, Novotorzhsk, Novgorod and Borovich.

#### REVISION OF THE RATES ON GOVERNMENT LINES AND ON THOSE OF GROUP III.

The lines belonging to the Government are the following: Baskunchaks, Warsaw-Terespol, Dzhankoi-Theodosia, Ekaterinin, Transcaucasian, Transcaspian, Kursk-Kharkov-Azov, Libau - Romny, Livno, Moscow - Kursk, Mourom, Orel-Griaze, Polessk, Pskov-Riga,

Rzhev - Viazma, Riga - Bolderaa, Riga - Toukoum, Syzran - Viazma, Sedlets - Malkin, Ural, Kharkov - Nicolaev.

Those of Group III, the following: Vladicaucasian, Griaize-Tsaritsin - Donets, Ekaterin, Ivangorod - Dombrovsk, Kursk - Kiev, Kursk - Kharkov - Azov, Libau - Romny, Lozovo - Sevastopol, Mitau, Moscow - Kursk, Nicolai, Orel - Griaize, Polessk, Vistula, Riga - Dvinsk, St. Petersburg - Warsaw, Fastov, Kharkov - Nicolaev and the South-Western.

The combined extent of trackage of these two groups exceeds 16,000 versts, or about one-half of the total length of the Russian railways.

The introduction of a common tariff on all these lines, which took place on January 1, 1893, was therefore an important step towards the ultimate adoption of one common schedule on all the Russian railways, to which end it was in fact a preliminary step.

The principal results of the revision were, in the first place, the substitution for existing antiquated tariff bases, of a new schedule elaborated with due regard to the altered conditions of the business life of the country. In the second place, the result that the tariff system is thereby greatly simplified, as instead of a motley variety of separate rates of individual lines, there is now only one general tariff with a limited number of special rates deviating therefrom. The new common tariff is applied not only with reference to direct, through traffic, but also, in cases of local traffic, on all the Government lines and on the greater part of those of Group III.

The main points of difference between the new tariff and the old are the following: The rate of transport of quick freight of every description is fixed at  $\frac{1}{6}$  of a kopeck per poud per verst. The charges on slow freight are arranged in twelve normal classes, having the following tariff-units per poud per verst as bases:  $\frac{1}{10}$ ,  $\frac{1}{12}$ ,  $\frac{1}{15}$ ,  $\frac{1}{18}$ ,  $\frac{1}{24}$ ,  $\frac{1}{30}$ ,  $\frac{1}{36}$ ,  $\frac{1}{40}$ ,  $\frac{1}{45}$ ,  $\frac{1}{55}$ ,  $\frac{1}{100}$  kopeck. Railway charges calculated on the bases of the first nine classes, are subject to a reduction, as follows: 10 per cent, when the distance exceeds 200 versts; 15 per cent, when it is more than 500 versts; 20 per cent, when above 1,000 versts; 25 per cent, when more than 1,500 versts, and 30 per cent when in exceeds 2,000 versts, with the object that rates for short distances shall not be proportionally lower than those for long distances. No reduction is allowed on charges on the bases of  $\frac{1}{65}$ ,  $\frac{1}{75}$ , and  $\frac{1}{100}$  kopeck per poud per verst. The reductions are made on the entire distance traversed, and are not calculated separately for each line and section of line, as was the case formerly. The system is practised on all the Government lines, and on those of Group III, and in the particular referred to it practically answers, to the forwarders, to a considerable reduction on the rates of transport to more considerable distances. Moreover, it tends greatly to simplify tariff accounts, as it was formerly insufficient to know the total distance traversed; the distance on each line and section of line had to be ascertained first and the charges made accordingly.

#### GRAIN FREIGHT RATES.

According to the «Code of tariffs», regulating the transport of foodstuffs, this sort of goods is subdivided into four categories. To the first belong grain, potatoes, malt and waste, such as chaff, bran, oilcake; to the second, melons, pumpkins, seed used in the manufacture of oil, and canary seed; to the third, wheat flour, potato flour, buckwheat flour, bean flour and every description of groats; and to the fourth belong rye flour, pea flour, maize flour, oat and barley meal.

The total quantity of grain transported in 1889 over the whole network of Russian railways, amounted to 497,000,000 pouds. In 1890, it fell to 485,000,000 pouds. The character and direction of these freights may be seen from the following table.

Destinations:	1889.		1890.	
	In thousands of pouds.	Per cent of total.	In thousands of pouds.	Per cent of total.
I. For export . . . . .	300,416	60·3	298,866	61·5
a. To Russian ports on the Baltic Sea . . . . .	105,596	21·2	109,089	22·5
b. To points along the western frontier and abroad . . . . .	52,192	10·5	40,058	8·2
c. To Black Sea and Azov ports . . . . .	142,166	28·6	149,453	30·8
II. To points in the interior . . . . .	197,506	39·7	186,661	38·5

These quantities are distributed among the principal places of destination as follows.

Ports.	Quantity of grain delivered by the railways, in thousands of pouds.		Frontier points.	Quantity of grain delivered by the railways in thousands of pouds.	
	1889.	1890.		1889.	1890.
Odessa . . . . .	46,931	51,652	Sosnovitsi . . . . .	7,042	5,812
St. Petersburg . . . . .	30,109	38,246	Alexandrovo . . . . .	4,128	4,076
Libau . . . . .	39,885	34,185	Volochisk . . . . .	4,182	2,568
Riga . . . . .	21,236	23,211	Radzivilov . . . . .	2,208	1,505
Sebastopol . . . . .	28,382	13,887	Interior points:		
Novorossisk . . . . .	20,336	32,468	Moscow . . . . .	31,220	32,923
Rostov - on - Don . . . . .	17,554	14,038	Warsaw . . . . .	9,323	7,676
Reval . . . . .	14,369	13,447	Samara . . . . .	6,504	7,529
Taganrog . . . . .	6,470	8,334	Saratov . . . . .	7,906	6,021
Marioupol . . . . .	3,010	3,562	Kiev . . . . .	2,603	2,800
Poti . . . . .	1,443	2,189	Tiflis . . . . .	2,535	2,606
Batoum . . . . .	654	323			
Genichesk . . . . .	291	818			

In 1889 the Transcaspian Railway delivered to Ouzoun-Ada on the Caspian, 462,000 pouds, which in 1890 were reduced to 226,000 pouds.

It will be apparent from the above particulars that the bulk of the grain carried by Russian railways is intended for export. The chief home markets are Moscow and Warsaw and their vicinity, while Samara and Saratov are mainly important, as being points of contact between the railways and the river and canal traffic.

The grain traffic was confined to a great extent to the Southern and South-Western Railway systems. In 1889 the southern lines conveyed 232,285,000 pouds, that is, 46·6 per cent of the entire quantity transported. The traffic on the eastern lines amounted to 179,839,000 pouds, or 36·1 per cent of the total. The two groups of lines show a total of 412,124,400 pouds, or 82·7 per cent of all the foodstuffs, carried by Russian railways during the year. Grain freights rank first among the articles transported by Russian railways; thus, in 1889, they formed 21·7 per cent, and in 1890, 20·7 per cent of the total.

In view of the fact, therefore, that the rates on grain freightage is of primary importance, even compared to every other description of goods, the Committee entrusted with the regulation of the tariffs, immediately on its opening, proceeded with the question of a revision of the operating grain freights.

Notwithstanding the complicated and immeasurably difficult nature of the undertaking, it was completed as early as the close of 1889, when the tariffs at present in operation were first introduced. They have now been working for more than three years; their efficacy therefore, which is shown by their continuance, is beyond question.

The guiding principles adhered to in the compilation of these tariffs were established in special consultation of the President and members of the Tariff Committee, together with representatives of the agricultural interests, the railways and other individuals having practical knowledge of the grain trade and the condition of the flour and meal manufacturing industries. The principles referred to are as follows: It was held to be necessary in the first place to put an end to the existing one-sided encouragement of the export, at the expense of the home trade. This retarding of the home traffic, through excessively high railway rates, resulted from the almost entire absence of direct through rates. The charges were therefore per force determined by the total of the charges made on each section of line traversed, which in their turn were based on exceedingly high units per poud-verst. In order to remedy this defect and put an end to a system that accorded neither with the interests of agriculture, nor with the needs of the people, it was decided to adopt a common formula according to which all railway charges should be estimated; the said formula was to present a limiting scale of rates on every description of goods, whether export, through, interior, or local freights, and to be arrived at on the basis of a differential reduction of the fundamental units per poud-verst, according to the distance traversed. It was further intended to serve as a means of fixing reduced through rates between all the stations of the system. According to this formula, therefore, the following bases of railway rates were adopted:

1 to 360 versts =  $\frac{1}{24}$  kopeck per poud-verst and 10 per cent rebate on any distance exceeding 200 versts.

361 to 1,600 versts = an additional charge of  $\frac{1}{80}$  kopeck per poud-verst.  
1601 and upwards = an additional charge of  $\frac{1}{200}$  kopeck per poud-verst.

The reconstruction of the tariffs in accordance with the above formula was effected with the utmost care, in order to avoid very fundamental errors or the transgression of the proper tariff relations of the various agricultural regions. The most important conditions that a railway tariff should fulfill were acknowledged to be stability and equality.

With a view to promoting the development of agriculture and stock farming it was found indispensable to reduce the railway rates on potatoes, bran, oilcakes and similar articles. Such a reduction, however, was only admitted in the case of freights directed to the home markets.

In the case of grain intended for export the following two principles were observed: in the first place, it was held to be indispensable that every grain producing district should be provided with the possibility of directing its produce to the greatest possible number of frontier stations, whether overland or seaport transit, in order to distribute the business more evenly among the different exporting centres and to offer the producers every opportunity to select the direction in which to dispose of their goods. In the second place, it was determined to withdraw the existing abnormal advantages enjoyed by the Black Sea ports over those of the Baltic, advantages that had been created by the former tariffs, as these executed a detrimental influence over the interests of the agriculture of the country, (Baltic prices are always higher than those on the Black Sea) as well as on the profits of the railway. Shipping rates from Baltic ports are always the lower, therefore, from the total cost of transport through these ports to Western European markets a considerably larger profit ensues to Russian railways. In order to encourage the export of cereals, not in the kernel but in the manufactured state, it was found necessary to offer a premium on the export of flour, groats and malt, in the shape of a reduction of ten per cent on the rates of carriage through the Empire, for foreign markets; and to promote the cultivation of potatoes and the manufacture of starch the same advantage was likewise extended to potato flour. With respect to home consumption it appeared more in harmony with the requirements of agriculture and the interests of the consumers to establish like tariffs both for grain and for flours. Lastly, in order to prevent any superfluous accumulation of grain products at the various ports and to regulate their distribution among the interior warehouses, including elevators, it was held necessary to support such warehouses by means of special exemptions, consisting in the permission to apply through rates in cases, of warehousing goods on the line of transport, and in the fixing of the lowest possible basis for divergencies from the direct route.

Such were the fundamental principles adopted at the first general revision of the tariff on cereals, carried out under the guidance of the new tariff institutions. The tariffs elaborated on these bases (export, through, interior, and local rates) were all united in one general code of grain tariffs which serves at present for the calculation of charges for the transport of grain.

The general schedule of charges referred to above is only applied, as has been mentioned, to distances for which no special table of rates has been fixed. In the compilation of those tables the schedule in question only served as the highest limiting scale, with which they very rarely coincide, by far the largest portion of the tables being considerably below the tariff units established by the formula.

Without citing the particular tariff tables it will be sufficient to enumerate the so-called dynamic average transport charges which are obtained not by means of a simple juxtaposition of the units of the tariff tables, but are deduced from the totals of the transport charges, made on the actual quantities of grain goods carried. The following average basis of this kind belong to the year 1889 and are estimated on the assumption that all the traffic during the year in question has been charged according to the new tariff.

The mean trackage covered in the transport of grain and other foodstuffs on Russian railroads during 1889 was 577 versts, and the mean rates, 76·43 roubles per car, or 13·24 kopecks per car per verst, which is equal to  $\frac{1}{46}$  kopeck per poud-verst. If the formula were adopted the mean rates would be  $\frac{1}{39}$  kopeck per poud-verst.

With the increase of the distance traversed the unit bases are evenly reduced; thus, with 100 versts trackage the basis was  $\frac{1}{21}$  kopeck; from 100 to 200 versts,  $\frac{1}{26}$  kopeck; from 201 to 500 versts, the charge was,  $\frac{1}{31}$  to  $\frac{1}{37}$ ; from 501 to 1,000 it was  $\frac{1}{42}$  to  $\frac{1}{49}$  kopeck per poud-verst. On distances from 1,001 to 1,400 versts the unit basis per poud-verst is lowered from  $\frac{1}{51}$  to  $\frac{1}{61}$  kopeck; from 1,401 to 2,100 versts it is decreased to  $\frac{1}{60}$  to  $\frac{1}{68}$  and on distances above 2,101 versts,  $\frac{1}{72}$  to  $\frac{1}{78}$  kopeck per poud per verst. The greater portion of transported grain goods, that is, 56·74 per cent of the entire quantity, is charged on the basis of  $\frac{1}{55}$  to  $\frac{1}{88}$  kopeck per poud-verst.

The mean trackage traversed by grain cargoes destined for export, that is, in the direction of the seaports and termini of the western frontier, amounted to 659 versts, the mean charge being 12·65 kopecks per car-verst or about  $\frac{1}{49}$  kopeck per poud-verst. With an increase of the distance traversed the charges are reduced in the following ratio: under 300 versts the rate is  $\frac{1}{28}$  kopeck per poud-verst; 301 to 601 versts it is  $\frac{1}{39}$  kopeck; 601 to 900 versts,  $\frac{1}{45}$  kopeck and over 901,  $\frac{1}{57}$  kopeck per poud-verst. In this manner grain conveyed to Black Sea ports over distances averaging from 198 to 407 versts paid  $\frac{1}{30}$  to  $\frac{1}{42}$  kopeck; while those carried to Baltic ports the distance being from 800 to 1,241 versts, the charges were considerably lower, that is,  $\frac{1}{60}$  kopeck for greater distances.

In the case of interior traffic the mean extent of trackage was 381 versts and the mean charge, 59·65 roubles per car, that is, 15·56 kopeck per car-verst, or  $\frac{1}{39}$  kopeck per poud-verst. With the increase of the distance traversed the units per poud-verst vary within the limits of  $\frac{1}{25}$  kopeck on distances below 100 versts; to  $\frac{1}{72}$  kopeck on distances from 2,100 to 2,400 versts.

The comparative proportions of the basis per poud-verst in the interior and export traffic on short distances, will be seen from the following table:

	Export.	Interior.
1 to 100 versts . . . . .	$\frac{1}{24}$ kopeck	$\frac{1}{25}$ kopeck
101 » 200 » . . . . .	$\frac{1}{26}$ »	$\frac{1}{27}$ »
201 » 300 » . . . . .	$\frac{1}{30}$ »	$\frac{1}{35}$ »

In the meantime 106,135 cars were run on distances not exceeding 300 versts. This number constitutes 54 per cent of the entire number of cars engaged in the transport of grain under the ratio for interior traffic; thus, a by far larger proportion of the goods conveyed under the above tariff pays the lowest rates per poud-verst, than is the case with grain transported abroad.

#### FREIGHT RATES ON SALT.

The principal salt industries in Russia are distributed to a great extent along the eastern, south-western and southern borders; the working of rock salt in the gov-

ernment of Ekaterinoslav, only discovered in 1887, has during the last decade attained great importance. In 1890 the total yield of salt was 84,857,000 pouds, of which more than 10,000,000 were taken in the government of Ekaterinoslav in the neighbourhood of the Donets line of railway where, in 1881 only 295,000 pouds were procured. Of the total quantity of salt obtained in 1890, 56,210,000 pouds were carried by various railway lines, that is to say, by direct through routes 25,253,000 pouds, and by local lines 30,456,000 pouds. So considerable a difference in favour of the local traffic is to be explained by the circumstance that the Baskunchak Railway, connecting the lake of that name with the Volga, is not included in the network of railways. This line conveyed 11,443,000 pouds. It would be more correct to consider it a branch line in which case the relative proportions of the through and local traffic would be very different. The principal points of departure were: Dekan station, on the Donets line, from which 7,489,000 pouds were dispatched; Odessa, from which 5,894,000 pouds were dispatched; Taganash station of the Lozovo-Sevastopol line from which nearly 2,000,000 pouds of Crimean salt were conveyed, and Salt Wharf station on the Griaze-Tsaritsin line which sent off 3,085,000 pouds of Astrakhan salt.

For some time the salt industries in the various districts were almost solely confined to the neighbouring markets, not entering into competition for more remote purchasers. Serious competition between the separate producing regions dates from the time when the trade in salt acquired fresh vigour in consequence of the raising of salt duties in 1881 and the development of the new Donets regions. The South-Western Railway lines being desirous to encourage the working of the Odessa salt deposits, which were to them an important article of transport, fixed exceedingly low rates for this product. Other roads, with a view to competition, lowered their prices likewise, without however taking the general requirements of the salt trade into due consideration. The result of this accidental adoption of tariff bands, the rates on salt transports were very unequal. It often occurred that they were higher for small distances than for the larger, and therefore a circuitous route was often preferred to the more direct.

The revision of the freight rates on salt was made in 1892; the companies and other interested parties tried greatly to limit the salt region of the Donets basin, as being under exclusively favourable conditions, namely, near to the home markets and cheap fuel, and in a good position, as concerns means of communication. The Committee of Revision, basing its decisions on the principle that the differences in the cost of production in various localities should in no way affect the freights, decided to establish a perfectly uniform system of rates on salt, without any reference to the industrial region producing it. As on most of the railways a rate of  $\frac{1}{45}$  kopeck was already in force the Committee adopted this rate as a basis of revision, and accordingly the following schedule was given out: From 1 to 405 versts,  $\frac{1}{45}$  kopeck per poud-verst; from 405 to 1,600 versts this rate to be increased by  $\frac{1}{65}$  kopeck per poud-verst; and for more than 1,600 versts the latter rate to be raised  $\frac{1}{150}$  kopeck per poud per verst. Such rates are now in force on all the joint-lines of the Russian railways. In order that the sudden change in this system of freights might not have a prejudicial influence on the long-established mercantile relations of the Empire, this schedule was applied immutably only to the Donets industry, while with regard to other regions certain modifications, although very inconsiderable, have been made.

## FREIGHT RATES ON PIG IRON, UNWRUGHT IRON AND STEEL.

On the whole in 1889, 52,303,000 pouds of pig iron, 31,086,000 pouds of iron and 16,769,000 pouds of steel were brought to the interior markets of Russia. Out of this number the imports were: pig iron 7,133,000 pouds; bar iron 5,283,000 pouds; steel and steel rails 979,000 pouds. For the Urals the principal markets are the Fair of Nizhni-Novgorod and the boarders of the Volga (Povolzhie), because there is no direct line from there joining other Russian railways, and the Ural factories are obliged to use the water ways which for 5 to 6 months are ice-bound. The position of the other three centres of the iron industry, the Sub-Moscow, the Southern and the Vistula regions, is much more favourable in this respect, as they are united to the network of railways and not far from the principal markets of consumption. Of the principal interior markets Nizhni-Novgorod is mainly furnished with the products of the Ural manufactories; the same is also true to a large extent of St. Petersburg, as it consumes a very small quantity of foreign iron; Moscow is supplied by the southern and south-western factories and by those of the Vistula region; Rostov-on-Don receives iron and other materials chiefly from the Urals, but lately also from the southern works. Odessa finds it equally convenient to get its supplies from the governments of Ekaterinoslav and the Vistula.

In 1890 there were transported by rail, on the whole, 27,336,700 pouds of unwrought iron and steel. The largest quantities were sent by the following railways: the Warsaw-Vienna, 5,303,400 pouds; the Moscow-Nizhni-Novgorod, 4,895,300 pouds; the Uralsk, 3,909,800 pouds; and the Griaize-Tsaritsinsk, 1,767,400 pouds; other railways carried not more than 1,000,000 pouds each; from the foreign railways 857,300 pouds were transferred to the Russian lines. With regard to the quantity of cargoes transported, the separate railways may be grouped in the following order: the Uralsk received 3,909,800 pouds; the Moscow-Nizhni-Novgorod, 2,426,900; the Warsaw-Vienna, 2,486,700; the South-Western, 1,956,400; the Griaize-Tsaritsinsk, 1,884,900; the Nikolaevsk, 1,690,200; the St. Petersburg-Warsaw, 1,265,000; the Transcaucasian, 1,241,000; the Moscow-Brest, 1,210,800 pouds; the other railways received less than one million pouds each. During the same year, 1890, on the whole, 15,219,200 pouds of unwrought cast iron have been transported; out of which the Ural Railway sent 4,315,300; the Riga-Dvinsk and the Riga-Boldera, 3,986,200; the Ekaterininsk, 2,677,100; and the Donets, 1,058,100 pouds. The cargoes of unwrought cast iron received, were as follows: by the Ural Railway, 4,315,300; the Orel-Vitebsk, 4,189,500; the Riga-Dvinsk, 2,113,400; and the Warsaw-Vienna, 1,006,300 pouds.

The regulating of the railway rates on pig iron, iron and steel has been done only in the beginning of 1892. The former rates were extremely irregular, unstable in character, and did not correspond either to the wants of the producer, or the consumer. Moreover, foreign wares were transported to the interior according to a very much lower scale of prices, while there existed but few direct freight schedules on home iron, and that, according to the local tariffs, at very high rates. At the revision of the tariffs, special attention was paid to the nomenclature because the terms, "unwrought cast-iron, iron and steel" were not sufficiently definite. In the new schedule, promulgated in the shape of a separate code, all the articles to which they refer are divided into five categories. The first comprises white and black unwrought tin, as well as iron and other

articles of the second and third categories, when they are plated with lead and zinc or packed in boxes or barrels; the second category comprises unwrought sheet and assorted iron and steel, pig steel, unbolted beams, columns, piles, untrimmed wheels, axles, clamps, rail tie-rods and bolts, pipes, sleepers, as well as new rails, when sent by poud-weight; the third category includes all kinds of scrap iron, steel, tin and cast-iron, cuttings and filings, puddled iron in bars, unwrought cast iron and old rails, when sent without being packed, or in open boxes and barrels; to the fourth category relate new rails, when sent in car loads; and finally, to the fifth, refer iron and manganese ores shipped by the car load.

According to the new schedule the rates on all these articles vary according to the category under which the freightage is placed, but they are applied equally to the local and to the direct through lines on all the Russian railways. As a basis for determining these charges the schedule of the import tariff was taken. On articles of the first category the rate was fixed according to the third class of wares of this schedule, beginning from  $\frac{1}{15}$  kopeck per poud-verst; for the second category, from one to 300 versts, according to the fifth class, beginning from  $\frac{1}{24}$  kopeck, and over 300 versts, according to the sixth class, beginning from  $\frac{1}{39}$  kopeck, but on the condition that the rate be not less than  $\frac{1}{65}$  kopeck per poud-verst; this double system of the rates on iron was established with a view of conciliating the interest of the factories nearest to the markets with that of those far distant therefrom. On articles of the third category the rates were appointed comparatively to the seventh class of the import tariff beginning from  $\frac{1}{36}$  kopeck; on those of the fourth category, according to the eighth class beginning from  $\frac{1}{40}$  kopeck; and on those of the fifth category,  $\frac{1}{65}$  kopeck per poud-verst with the same differences as are allowed for the lowest classes of the import tariff. All the above mentioned freight rates relate to the articles of the three first categories when reckoned per poud, and to the fourth (new rails) and fifth (ores) when reckoned per car. Digressions from the formula are allowed only in very exceptional cases when positively proved to be necessary. Additional rates are collected on general bases.

#### FREIGHT RATES ON MINERAL FUEL.

The working of coal mines in Russia is carried on mainly in four basins. With reference to the richness and the varieties of the coals, the first place of importance must be allotted to the Donets basin, as having all the kinds of coal used in the manufactures, for railways, steam navigation and heating of houses. Then comes the Polish basin intersected by the Warsaw-Vienna and the Ivangorod-Dombrovsk railways. The third place is held by the basin of the Urals in which the deposits of coal are considerable, but the working thereof poorly developed, owing to the lack of demand on the side of the mining works, exploiting forests, and to the costs of the transport to the interior markets. The fourth is the Sub-Moscow basin in which the local coal has strong competitors in the better English and Donets coals, as well as in raw naphtha and its residues.

On the whole in 1889 there were obtained 379 million pouds of coal in Russia; the import across the European frontier was 125,896,000 pouds. Along the whole network of railways in 1890 there were transported 259,314,000 pouds. The greatest quantity was loaded at the stations of the Warsaw-Vienna Railway, namely 90,406,000 pouds; then follow the Donets, 73,741,000; Kozlov-Voronezh-Rostov, 22,408,000; Ivangorod-Dom-

brovsk, 17,529,000; Ekaterininsk, 16,779,000; Kursk-Kharkov-Azov, 13,446,000; Uralsk, 7,969,000; Nikolaevsk, 5,342,000 and Syzran-Viazma, 5,046,000 pouds. The transport by the other railways did not exceed five million pouds each. According to the quantity of coal received the railways may be placed in the following order: Warsaw-Vienna, 59,807,000; the Lodz Factory Railway, 24,514,000; Ekaterininsk, 21,873,000; Kursk-Kharkov-Azov, 20,315,000; Kozlov-Voronezh-Rostov, 17,816,000; Kharkov-Nikolaev, 16,174,000; Donetsk, 11,598,000; South-Western, 11,110,000; Moscow-Kursk, 10,660,000; Uralsk, 7,969,000; Lozovo-Sebastopol, 7,910,000; Vistula, 6,805,000 and Fastovsk, 4,697,000 pouds.

Before the Government regulations with regard to freight rates, the railways in order to escape the unprofitable running of empty cars from the ports to the interior of the country allowed the transport of foreign coal on return trips at the rate of  $\frac{1}{75}$  kopeck (Riga and Libau) and  $\frac{1}{86}$  kopeck (St. Petersburg) per poud-verst, the transport of the Russian coal to these ports being about  $\frac{1}{65}$  and  $\frac{1}{60}$  kopeck. Therefore, the sale of the Russian coal was limited to the localities situated in the vicinity of the regions where it was mined. This coal could reach more distant markets only where the railways in their own interests offered especially low rates in order to develop a manufacturing industry that would in turn give paying cargoes. But these measures were not of much importance because the reduction did not depend upon the needs of the trade industry but upon the casual understandings between the railway companies with a view to secure paying freights. The general review of the freight schedules was concluded in 1890; prior to that date it had been carefully revised in separate councils, formed by representatives of the railways and of the coal industry.

In order to remove the tyranny of the foreign coal in the Moscow manufacturing region and to aid the Russian coal industry in that locality especially, the following measures were taken. The freight rates from St. Petersburg were raised from  $\frac{1}{86}$  to  $\frac{1}{65}$  kopeck, and those from Riga and Libau, from  $\frac{1}{75}$  to  $\frac{1}{65}$  kopeck per poud per verst; in the mean time the freight rates on the Donets coal were lowered to  $\frac{1}{90}$  per poud per verst, which forms about 12 kopecks per poud for the whole distance from the stations of this basin to Moscow; thus all the kinds of coal necessary to the manufactures were brought to the Moscow market, and the monopoly of the sale from the neighbouring coal mines was ended. In order to guarantee to Moscow the furnishing of the coal at specified rates, two lines for the transport thereof were opened, one through Kursk, the other through Kozlov. The freight rates for the Polish coal were lowered approximately to 13·55 kopecks per poud, or to  $\frac{1}{107}$  per poud per verst. The freight rates of the Nizhni-Novgorod Railway for the Ural coal were lowered to 4·1 kopeck per poud ( $\frac{1}{100}$  kopeck) from Nizhni-Novgorod to Moscow. Finally the rates for the Sub-Moscow coal were also lowered. The charges on the Donets coal sent farther than Moscow were fixed by means of adding to the 12 kopecks as follows:  $\frac{1}{305}$  kopeck per poud per verst to St. Petersburg by the Nikolaevsk Railway; and  $\frac{1}{100}$  kopeck per poud per verst on the Moscow-Yaroslav and Moscow-Nizhni-Novgorod Railway. The freight of 12 kopecks was also applied on the crossing Sub-Moscow lines, the distance of which equalled that of Moscow. The rates to the localities situated nearer than Moscow are reckoned according to those applied on the Donets coal carried to the south-western region. Furthermore, freight rates of 12 kopecks with  $\frac{1}{100}$  kopeck added to them per poud per verst were established to the manufacturing points of the forest regions where coal is expected to supplant wood.

In the northern and southern ports of Russia, as well as in the tract adjoining

the western land frontier, foreign coal and coke are used in considerable quantities, while Russian coal and coke are brought in very small quantities. Therefore, the freight rates on coal of the two principal Russian coal basins to these points are lowered to  $\frac{1}{125}$  kopeck per poud and per verst, and lower freights have been also established to all the points of the north-western region, where the use of coal is expected to spread in the nearest future. As the price of the Donets coal in the northern ports, even if sent at the freight rate of  $\frac{1}{125}$  kopeck, would still exceed that of the foreign coal, it was decided to send to these ports the Donets coke, equalling in quality the best foreign products, leaving the neighbouring Polish basin to furnish the coal; meanwhile the freight rates to the Odessa region from the two coal basins were lowered to  $\frac{1}{125}$  kopeck.

#### RATES ON KEROSENE AND PURIFIED NAPHTHA PRODUCTS.

In 1891 on the Apsheron peninsula in the vicinity of Baku there were obtained 289,000,000 pouds of raw naphtha; the amount of the purified products was 82,000,000 pouds. Of the total quantity of purified oils two-thirds are exported, only one-third going for home consumption. The export is mainly by means of the Transcaucasian Railway through Batoum, and only 15 per cent via Libau, Riga, St. Petersburg, Reval and the points of the western land frontier. The principal interior markets are Warsaw, Moscow and St. Petersburg.

The total sum of the transports of kerosene by rail formed in 1890, 73,375,200 pouds. The largest amount of cargoes was sent from the stations of the Transcaucasian Railway, namely, 45,305,400 pouds; then follow the Griaze-Tsaritsinsk, 11,855,100; Syzran-Viazemsk, 6,749,400; Moscow-Nizhni-Novgorod, 3,295,100; Orel-Griaze, 2,116,500; South-Western, 2,103,800; Vistula, 1,779,800; Kozlov-Saratov, 1,713,400 pouds; the cargoes sent by the remaining railways did not exceed one million each. With regards to the arrivals of the kerosene cargoes the railways may be placed in the following order: the Transcaspian Line, not joined to the general net of railways, received 45,305,400 pouds; the Nikolaevsk, 3,255,800; Warsaw-Vienna, 2,162,500; South-Western, 1,989,800; Vistula, 1,933,000; Orel-Griaze, 1,692,400; Griaze-Tsaritsin, 1,464,900; Warsaw-Terespol, 1,252,100 Libau-Romny, 1,045,600; Moscow-Riazan, 1,189,300; the remaining received less than one million pouds each.

The schedule now in force was established in 1891, when a general revision of the freight rates on kerosene and other refined naphtha products took place. The chief principles upon which it was based consisted in the following: First of all, limits were drawn between the Black Sea ways of communication, on the one side, and those of the Caspian on the other, the freights from Baku by rail being uniform via Tsaritsin, as via Batoum-Odessa. The rates from Tsaritsin to Kiev and from Baku to Batoum, together with those from Odessa to Kiev, were fixed at the uniform figures of 214·50 roubles per tank. In a like manner the rates from Tsaritsin and from Odessa to Warsaw and several other interior points have been fixed. From the other stations on the Volga, besides Tsaritsin, the freight rates were: from Saratov 2½ kopecks and from Nizhni-Novgorod, 7·2 kopecks less per poud than from Tsaritsin; from Yaroslav 2·8 kopecks and from Rybinsk, 3 kopecks less than from Nizhni-Novgorod. The rates are fixed for the transportation in railway tanks; if the shippers use their own tanks the charges are diminished 2 kopecks per car per verst. In general, in working out the tariffs of direct com-

munication from Tsaritsin the following schedule was followed: for a distance from 1 to 29 versts, the rates are 50 kopecks per car-verst; from 50 to 65 versts, 30 kopecks; from 80 to 450 versts, 25 kopecks; from 576 to 685 versts, 20 kopecks; from 748 to 900 versts, 18½ kopecks and so on; for distances exceeding 1,876 versts the rates per car-verst are fixed to 13·15 kopecks. The freight rates for the intermediate distances, that is, from 29 to 50 versts, from 65 to 80 versts, from 685 to 748 versts et cetera, are fixed by means of an increase of 2 kopecks per car-verst of the freight rates of the preceeding range.

The freight rates reckoned according to this schedule refer also to the tare transports; moreover, they include the station charges, to the amount of 4·27 roubles. The return transportation of the tanks is free. The above schedule is equally used in the local communication of 33 railways with the sole difference that the station charges are reckoned separately.

The export tariffs have been left unchanged. They were based on the freight rates from Tsaritsin to Libau reckoned at  $\frac{1}{100}$  kopeck per poud-verst; from the other stations, namely from Saratov, Nizhni-Novgorod and Yaroslav the rates are regulated according to the different distances between the stations. The same low rates are in force for the exports via Reval, Riga and St. Petersburg. The export charges via the points of the western land frontier (Eidkunen, Prostken, Illovo, Alexandrovo, Granitsa and Sosnovitsy) are fixed at 7 kopecks per poud-verst from Tsaritsin, and from other stations, according to the difference in the distances. Finally, the export rates from Odessa, through the points of the western land frontier, equally low freight rates obtain, namely  $\frac{1}{100}$  kopeck per poud-verst.

Naphtha residues are shipped from Baku chiefly to the Volga, whither in 1890, 86,600,000 pouds were sent; at the same time 8,200,000 pouds were exported by the Transcaucasian Railway. Of the naphtha residues sent to the Volga only 25 million pouds go by rail. The largest amount of the freights take the route from Nizhni-Novgorod to Moscow. The rates for this distance are 39·84 roubles per car, that is,  $\frac{1}{65}$  kopeck per poud-verst; when the railway tanks are used for the transportation  $\frac{1}{4}$  kopecks are added thereto per verst. The return transportation of the tanks is free.

The regions of the stations of destination under the direct reduced tariffs are fixed according to the method used with reference to kerosene. From the stations on the Volga to those lying to the north of the line Griaze-Orel-Briansk-Gomel the freights are fixed accordingly to a general schedule, and the old tariffs are still in force for the shipments to the stations lying to the south of that line. The schedule comprises the following freight rates per poud-verst: for distances from 1 to 120 versts, 25 kopecks; from 121 to 302 versts to the freight rates for the distance of 120 versts,  $1\frac{3}{4}$  kopecks per tank is added per verst; from 303 to 500 versts, 10·98 kopecks; furthermore, gradually with the increase of the distance to 1,711 versts the charges diminish to 9 kopecks per car-verst. If the senders use their own tanks these freight rates are diminished by  $\frac{1}{4}$  kopecks per verst.

#### FREIGHT RATES ON FLAX AND HEMP CARGOES.

In 1889 the transportation by rail of flax cargoes equalled 13,074,212 pouds, out of which 9,895,268 followed the export route and 1,238,383, the interior lines of direct com-

munication, and 1,940,561 pouds, the local lines. The hemp cargoes in the same year amounted to 6,629,329 pouds, out of which 4,811,348 took the export route, 946,630 the interior lines of direct communication, and 871,351 pouds, the local lines. Flax is exported chiefly through the Baltic ports, namely about 6 million pouds; the first place is held by Riga (2,500,000 pouds); hemp is chiefly exported across the western land frontier, namely, two-thirds of the whole export fall thereto.

A general revision of the freight rates on flax and hemp was made in 1892, and the new rates for the Russian railways were enforced January 1, 1893, and those for the lines in direct communication with the foreign, February 18, 1893. The new rates are very simple and uniform. Instead of the many former tables three schedules are fixed for all kinds of transportation, namely export, interior, and local. The first schedule refers to the shipments per poud, the freight rates being  $\frac{1}{18}$  kopeck per poud-verst on raw flax, combed flax, hemp and rope yarn, and  $\frac{1}{24}$  kopeck on flax and hemp tow, combings and other residues. These freight rates are reduced 10 per cent for distances exceeding 200 versts; 15 per cent for distances exceeding 500 versts; 20 per cent for over 1,000 versts; 25 per cent for distances over 1,500 versts; and 30 per cent for distances over 2,000 versts, but with the condition that the freights for longer distances shall not be less than those for the shorter. These rebates are made not with reference to a separate line but according to the general distance.

The second schedule is fixed for the transport of flax, combed flax, hemp and rope yarn per car. The freight rates on such cargoes are: from 1 to 300 versts  $\frac{1}{18}$  kopeck per poud-verst with a reduction of 10 per cent for a distance exceeding 200 versts; for the distance from 301 to 1,200 versts to the freight rate for 300 versts (15 kopecks)  $\frac{1}{15}$  kopeck is added per poud-verst; and for distances over 1,200 versts to the freight rate for 1,200 versts (27 kopecks)  $\frac{1}{150}$  kopeck is added per poud-verst.

The third schedule is established for the sending of flax and hemp tow, combings and various residues per car load. According to this schedule the rates are  $\frac{1}{24}$  kopeck per poud-verst for a distance from 1 to 455 versts with a rebate of 10 per cent for distances over 200 versts; for the distances exceeding 455 versts the freights are fixed in a like manner to those in the second schedule.

The rates on Russian railways in direct communication with the foreign lines are reckoned also by the above-mentioned schedules.

Special rates digressing from the schedules are allowed to a very limited extent, only in such cases where the going over to the new freight rates would be burdensome, and have an unfavourable influence upon the already established mercantile relations, or when there could be a competition of transportation by water. The rates from St. Petersburg to Reval were left unchanged, namely 11·57 kopecks per poud on flax, as well as on tow, while according to the schedule they should be 15·63 kopecks on flax and 13·01 kopecks on tow, but such an increase might send the cargoes by water instead of by rail. For the same reason the freight rates on flax and tow from Riga to Libau were left unchanged, namely 5·68 kopecks per poud. The rates from Rybinsk to St. Petersburg were fixed at 16·69 kopecks per poud instead of 18·69 roubles, as they should be according to the schedule; this was done in order to enable the railroads to compete with the water ways of the Volga and the Mariinsk system of canals. Accordingly, the rates have been diminished from the other stations of the railways, Rybinsk-Bologoe, Moscow-Yaroslav, and Yaroslav-Vologda, and not only to St. Petersburg, but to Reval as well.

## FREIGHT RATES ON SUGAR AND BEET.

The production of sugar is chiefly centred in the south and south-west of Russia, as well as in the Vistula governments. Most of the manufactories working lump and refined sugar are situated there. Some of the refineries, however, are in the central region (Tula, Moscow) and even in the north (St. Petersburg), and in the east, near the principal markets. From all the stations of the railways running across these regions, for the years 1888 and 1889, on the average 19,186,600 pouds of raw sugar and 15,812,200 were despatched. The greatest quantity of raw sugar, namely 12,932,000, or two-thirds (67 per cent) of the total were sent from the stations of the south-western railways and the adjoining Fastovsk line; 4,626,000 pouds of refined sugar have been sent from these railways. A quantity of 4,716,000 pouds of refined sugar was sent by the Kursk-Kiev, Libau-Romny, Kharkov-Nikolaev and Kursk-Kharkov-Azov railways; from Moscow 2,500,000 pouds have been despatched.

The general revision of the rates on sugar was made in 1892. The former schedule called forth complaints and protests from the manufacturers and trades people, not because of their absolute dimensions, but almost exclusively because of their inequality and disproportion, giving unjust advantages to certain factories. In regulating the freight rates on raw and refined sugar the greatest difficulty consisted in placing the factories of the south-western and central regions in practically equal conditions with regard to the sale of the refined sugar on the principal markets, and in the mean time not to lessen the profits of the railways for the transportation of sugar cargoes. With this view the new rates were established conformably to a uniform schedule with rebates in percentage on the freights according to the increase of the distances. The rates on raw sugar according to this schedule were: for 1 to 954 versts,  $\frac{1}{18}$  kopeck per poud-verst with due abatements; from 954 to 1,500 versts the rate for 954 versts was increased by  $\frac{1}{50}$  kopeck per poud-verst; from 1,501 to 2,000 versts, to the price fixed for 1,501 is added  $\frac{1}{80}$  kopeck; above 2,000 versts to the price fixed for 2,000,  $\frac{1}{100}$  of a kopeck is added per poud-verst. The freight rates on sugar for distances from 1 to 160 versts is  $\frac{1}{12}$  kopeck per poud-verst; from 161 to 400, to the price fixed for 160 versts,  $\frac{1}{36}$  of a kopeck is added; for more than 400 versts the rates on lump sugar are the same as those on granulated.

Exceptions are made only in a few cases, dependent on the competition of the water and overland transportation, or on local conditions of some regions and railroads not joined with the other railways, as for example, the Transcaucasian. These exceptions consist in the following: on railroads of the Warsaw region the rates of freight on lump sugar is the same as on granulated, namely,  $\frac{1}{18}$  kopeck; those on lump sugar from Moscow to Nizhni-Novgorod and Yaroslav are calculated according to those on granulated sugar; the freight rates as far as Saratov are fixed five kopecks cheaper than the general prices; to the other harbours of the Upper Volga the rates are the same as those of Yaroslav, added thereto the port expenses; for the Lower Volga ports they are fixed according to the list of prices, lowered by 5 kopecks. For the carrying of goods from the railway stations of the Warsaw region to St. Petersburg the rates are formed according to the prices to Libau which are fixed by adding 8 kopecks to the list prices. In the Transcaucasian railway tariff, calculated according to the limit duty, which is

on lump sugar  $\frac{1}{8}$ , and on granulated,  $\frac{1}{12}$  of a kopeck, the freight for the whole distance from Batoum to Baku, and from Poti to Baku, is 37·28 kopecks per poud.

There are separate rates for the transport of beet. For a distance of 55 versts,  $\frac{1}{65}$  kopeck is charged per poud per verst; for 55 to 63 versts, 0·83 kopeck per poud; from 64 to 140 versts,  $\frac{1}{75}$  kopeck per poud per verst; from 141 to 188 versts,  $\frac{1}{80}$  kopeck; above 188 versts,  $\frac{1}{100}$  kopeck per poud per verst. The station expenses for transporting beet is lowered to 0·1 kopeck per poud, the ordinary charge for this class of goods being 0·4 kopeck.

#### THE FREIGHT RATES ON CATTLE WITH THEIR KEEPERS.

In 1890, on Russian railways, 845,362 head of cattle were transported, of which were exported as follows: 155,180 by the Fastovsk Railroad; 118,705 by the Griaize-Tsaritsin; 72,373, by the South-Western; 60,556, by the Libau-Romny; 52,869, by the Warsaw-Terespolsk; by each of the other railroads less than 50,000 head of cattle were exported.

The import was as follows: to the Moscow-Riazan Railway, 142,306; to the South-Western, 120,991; to the Nikolaevsk, 88,520; to the Fastovsk, 70,891; to the Moscow-Kursk, 66,306; to the St. Petersburg Warsaw, 56,815; to the Warsaw-Terespolsk, 53,376; to each of the remaining railways, less than 50,000 heads of cattle.

In 1891 a general examination of the freight rates on cattle and their keepers took place, because of the veterinary measures for preventing the spread of the plague amongst the cattle during transport. On May 27, 1891 a new law was published, concerning the obligatory transport of cattle by railways, and the closing up or opening of roads for driving cattle. By this law the railways are obliged to carry cattle at a rate not exceeding 1·25 kopeck per head per verst in all cases, when the driving of cattle by the high roads is prohibited. In consequence the Ministry of the Interior, in conjunction with that of the Ways of Communication and that of Finance established new regulations, covering the methods of the transport of cattle in European Russia. These regulations consist in the following: according to the conditions of the transport of cattle, Russia is divided into three regions, A, B and C. In the first, the stock in droves, and designated for sale, may be moved only by rail; stock not in herds, such as serve for breeding or working, may be driven, but only into the neighbouring governments, and that only when no plague is raging. In region B, the driving of cattle to different localities for being fattened, to fairs and the like, is permitted, but that only according to the conditions mentioned in the regulations. The transport of cattle from region B to region A, must be absolutely by railway. In the third region the driving of cattle is not at all prohibited, but their transport to the other regions must be only by rail. Conformably to this the Freight Committee decided that the railroads must carry live stock at a price not to exceed 1·25 kopecks, per head per verst: 1. within the region A; 2. in carrying cattle from region B to A; 3. from region C to A or B.

The railroads were then similarly divided into three regions with reference to freight rates, as follows: The freight on individual cattle, by all the railroads, is 3 kopecks per head per verst, except on the Transcaucasian railway, where it is 3·75 kopecks. In transporting cattle in cars, containing 8 head each, the freight, on the greater part of the railways, is fixed at 1·25 kopecks per head per verst. If the despatcher wishes to place more

than 8 heads of cattle in a car, which is the normal, the freight on the first extra head is the same as on the preceding ones and on the second and following, 20 per cent less than the ordinary freight, but in every case not lower than 1 kopeck per head per verst. When a smaller number of cattle than the normal is put into a car the rate is fixed according to the piece freight rate, but in such a manner that it should not exceed the freight on a car containing eight heads. The freight on cattle keepers is  $\frac{3}{4}$  kopeck each per verst, if no 3d class car accompanies the train for that purpose; but if the keeper wishes to go in the third class car he must pay the ordinary passenger rates. Exceptions are made only in few cases and consist in that the freight for short distances, less than 100 versts, is raised to 2 kopecks each per verst, but when the distance is greater, even to 200 versts, the freight decreases to 1 kopeck per verst.

#### FREIGHT RATES ON HORSES.

In 1890, 94,686 horses were transported by railroads; of this number 10,280 were from the stations of the Mitau Railway; and 8,067, by the Orel-Vitebsk. The freight rates on horses, for direct and local transport by all Russian railways, were only introduced on February 13, 1893.

Horses are divided into three categories, each having a separate freight rate. The first category consists of such horses as are sent, according to certificates of the Imperial Studs or their agents, to take part in races or Russian exhibitions. The freight on such horses in fast trains, except post-trains, is as follows: 4 kopecks per head, per verst when sent separately; when transported in cars containing 4 horses, the distance being from 1 to 500 versts, the freight is 16 kopecks per car per verst; from 501 to 1,000 versts, to the price for 500 versts, 12 kopecks are added per car per verst; from 1,000 to 1,500 versts, to the price fixed for 1,000 versts, 10 kopecks are added per car per verst; and for more than 1,500, to the foregoing freight 8 kopecks are added per car per verst.

To the second category belong breeding horses and mares of the Imperial and different private studs, and for their transport on slow trains the following freights are fixed: when sent separately, 3 kopecks per head per verst, in localities where no lower freight rates exist; by transport in cars, not containing more than 4 horses, the distance being from 1 to 100 versts, the freight is 12 kopecks per car per verst; from 100 to 500 versts, to the price fixed for 100 versts, 10·75 kopecks are added per car per verst; from 501 to 1,000 versts, to the preceding freight, 9 kopecks are added per car per verst; from 1,000 to 1,500 versts, 8 kopecks are added; from 1,500 to 2,000 versts, 7 kopecks; and for more than 2,000 versts, 6 kopecks are added.

To the third category belong horses sent without any certificates. The freight on such in slow trains is as follows: when sent separately, 3 kopecks per head per verst, in localities where no lower freight rate exists; when carried in cars, independent of the number of horses, for a distance from 1 to 100 verst, 18 kopecks per car per verst; from 107 to 266 versts,  $16\frac{3}{8}$  kopecks; from 286 to 433 versts,  $15\frac{3}{8}$ ; from 467 to 600,  $14\frac{3}{8}$ ; from 651 to 780,  $13\frac{3}{8}$ ; from 851 to 960,  $12\frac{3}{8}$ ; from 1,057 to 1,200,  $11\frac{3}{8}$ ; from 1,500 and more versts, 9 kopecks per car per verst. The freight for points between these fixed distances is the same as for the whole distance. The litter and fodder (not exceeding

2 pouds per horse) harness, saddles and the like, as also colts going with their mothers, are transported gratis.

On keepers accompanying the horses, the freight is  $\frac{3}{4}$  kopeck each per verst, not counting the State dues.

The freight on manure, on all Russian railways, is  $\frac{1}{65}$  kopeck per poud per verst, when transported in pouds; when in cars, for a distance of 390 versts,  $\frac{1}{65}$  kopeck per poud per verst; from 391 to 480, 6 kopeck per poud, for the whole distance; from 481 to 1,200,  $\frac{1}{80}$  kopeck per poud per verst; from 1,200 to 1,800, 15 kopecks per poud, for the whole distance; and for more than 1,800 versts,  $\frac{1}{120}$  kopeck per poud per verst.

Milk products, except melted butter, are carried in passenger and fast trains at the freight rate of  $\frac{1}{12}$  kopeck per poud per verst, with the following reductions: from 201 to 500 versts, 10 per cent; from 501 to 1,000 versts, 15 per cent; and from 1,001 versts and more, 20 per cent.

The freight on live domestic fowls on all Russian railways is as follows: when transported in cars containing one row of fowls, 10 kopecks per car and per verst; containing two rows, 15 kopecks; three rows, 17.5 kopecks; and four rows, 20 kopecks.

The freight rates on other goods, not mentioned above, have not been subject to an examination, except on some articles, such as paper, pasteboard, Russian mineral waters and the like; therefore, these freights are different on separate railways. It is impossible to examine the freights of all the railroads, nevertheless some of them are of great importance for the total amount of the Russian trade, and of the railway transports. Such are the freights on wood materials, lumber, fish, wool, tobacco and spirits. Therefore, to render the present article on freight rates complete, the freight on these goods at the Government railways and at those belonging to the Group III, are also mentioned. These railroads form nearly the half of the total extension of the Russian railway system, and therefore the rates fixed for them will probably be also soon adopted on all the other railways of the Empire.

#### WOOD FOR BUILDING PURPOSES.

The total transport of wood materials amounted in 1890 to 135,863,600 pouds. The freight thereon at the Government and third group railways is  $\frac{1}{18}$  kopeck per poud. The freight for transport in cars is as follows: to 60 versts,  $\frac{1}{24}$  kopeck per poud per verst; to 75 versts, 2.5 kopeck per poud for the whole distance; to 233 versts  $\frac{1}{30}$  kopeck; to 280, 7 kopecks per poud for the whole distance; to 300 versts,  $\frac{1}{36}$  kopeck; to 333, 7.5 kopecks per poud for the whole distance; to 444,  $\frac{1}{40}$  kopeck; to 529, 10 kopecks per poud for the whole distance; to 556,  $\frac{1}{45}$  kopeck; to 682, 10.5 kopecks per poud for the whole distance; to 715,  $\frac{1}{65}$  kopeck; to 825, 11 kopecks per poud for the whole distance; for more than 825 versts,  $\frac{1}{75}$  kopeck per poud per verst.

The freight on lumber, transported per poud, is  $\frac{1}{24}$  kopeck per poud and per verst, and when transported in cars, these rates are the same as on wood materials.

The total amount of fish goods transported by railways was, in 1890, 24,559,000 pouds. On the most valuable of them, such as anchovies, smoked or dried sturgeon, caviar, pilchards, lobsters, crabs, sardines, and all fish in jars, a freight of  $\frac{1}{10}$  kopeck per poud is imposed. For all other fish goods the freight is as follows: when transported

in pouds,  $\frac{1}{18}$  kopeck per poud and per verst; and when in cars, to 200 versts,  $\frac{1}{18}$  kopeck per poud and per verst; to 296 versts, 11.11 kopecks per poud for the whole distance; and for more than 296 versts,  $\frac{1}{24}$  kopeck.

Of wool, the total amount transported in 1890 by all the railways, was 7,246,800 pouds. When carried in pouds the freight is  $\frac{1}{12}$  kopeck per poud per verst; and when transported in cars,  $\frac{1}{24}$  kopeck per poud per verst.

Of tobacco and tobacco goods, 6,861,000 pouds were transported by railroad, in 1890; of them, 1,033,800 pouds by the Libau-Romny Railway; 880,600 pouds by the Kursk-Kiev; 581,200 pouds by the Vladicavcasian line; 439,000 pouds, by the St. Petersburg-Varsaw; and 407,000 pouds by Kozlovo-Voronezh-Rostov. For transport per poud the freight is as follows: on foreign leaf tobacco and tobacco goods  $\frac{1}{10}$  kopeck per poud per verst; on Russian tobacco,  $\frac{1}{12}$  kopeck; on common tobacco, bakoun, makhorka, and snuff tobacco,  $\frac{1}{15}$  kopeck, and when transported in cars,  $\frac{1}{24}$  kopeck.

Of spirits, 9,851,700 pouds were transported in 1890, of which 4,077,700 pouds were in direct communication. The freightage in barrels is taxed  $\frac{1}{15}$  kopeck per poud per verst, and in bottles,  $\frac{1}{12}$  kopeck. When transported in cars the freight on spirits in barrels, large or small, and in car-cisterns, is as follows: to 550 versts,  $\frac{1}{18}$  kopeck; to 734 versts, 26 kopecks per poud, for the whole distance, and for more than 734 versts,  $\frac{1}{24}$  kopeck per poud per verst. The transport to ports and frontiers is taxed: to 320 versts,  $\frac{1}{24}$  kopeck per poud and per verst; to 400 versts, 12 kopecks per poud, for the whole distance; to 500 versts,  $\frac{1}{30}$  kopeck per poud per verst; to 635 versts, 15 kopecks per poud, for the whole distance and for more than 635 versts,  $\frac{1}{36}$  kopeck per poud and per verst. When spirits is transported in cisterns, they are brought back gratis.

#### TRANSPORT BY INTERIOR WATER WAYS.

The total extent of natural and artificial water ways in European Russia amounts to about 56,000 versts, of which rafting rivers form 23,000 versts; navigable, 33,000, while steamers cover a distance only of 20,000 versts.

The statistical data, given below, and which show the quantity of goods carried by water ways, are founded on official information, which is considered to be, however, lower than the real transport. This is caused by the fact that the freight on transports by water amounts to  $\frac{1}{4}$  per cent of the value of the goods carried, but as the proprietors of such goods value them themselves, and as such valuation and quantity of goods are not verified, the proprietors often show the goods to be of less value and quantity than they are in reality.

The total amount of goods carried by the interior water ways of European Russia, not including Finland, Caucasus and the Vistula regions, on vessels and rafts, was on the average from 1888 to 1890, about 1,100,000,000 pouds. The greater part of these goods, namely, 725,700,000 pouds or 66 per cent, were carried by the water ways which form the Volga-Neva-North-Dvina-Onega system; 314,000,000 pouds, or 28.5 per cent, by the Dnieper-West-Dvina-Neman-Vistula system. By the separate basins of the Don, Dniester and Narova, with the lake Choudsk, 59,800,000 pouds, or 5.5 per cent, are transported, of which 31,600,000 pouds go by the Don; 15,600,000, by the Dniester; and 12,600,000, by the Narova.

Lumber and wood materials occupy the first place, as to their quantity transported by water ways, amounting yearly in the three-year period from 1888 to 1890, to 698,770,000 pouds. They are principally carried in rafts and form nearly the total cargo on some river basins; thus, on the Onega, 98·5 per cent; West-Dvina, 98 per cent; Neman, 92·5 per cent; Vistula, 100 per cent; and on the Narova, 98 per cent of the total cargo.

Of the total transport mentioned above, 412,770,000 pouds, or 59 per cent, are carried by the Volga-Neva-North-Dvina-Onega system; 257,400,000, or 37 per cent, by the Dnieper-West-Dvina-Neman-Vistula system; 13,300,000 pouds, or 1·9 per cent, by the basin of Don; 3,000,000 pouds, or 0·4 per cent, by the Dniester; and 12,300,000, or 1·7 per cent, by the Narova.

The principal points of destination of wood and lumber transports are, St. Petersburg, 121,070,000 pouds; Novgorod on the Volkhov, 1,141,000 pouds; Vyshni-Volochok on the Tsna, 13,663,000 pouds; Astrakhan, 9,443,000 pouds; Tsaritsin, 24,601,000; Saratov, 6,520,000; Kazan, 9,231,000; Nizhni-Novgorod, 7,130,000; Yaroslav, 6,404,000; Tver, 12,000,000; Moscow, 8,405,000; Archangel, 8,274,000; Kiev, 14,776,000; Ekaterinoslav, 12,262,000; Kherson, 8,729,000 and Kovno, 6,855,000 pouds. Goods for export principally go through Riga, 55,354,000 pouds, and through Urburg, 70,298,000.

Among the other transports by water the most valuable are bread cereals. The total quantity of such transports was, on the average, from 1888 to 1890, 161,400,000 pouds, or 64·5 per cent, of which 104,095,000 were carried by the Volga-Neva-North-Dvina-Onega system; and 35,913,000 pouds, or 23·3 per cent, by the Dnieper-West-Dvina-Neman-Vistula system. In the first of these systems cereals are principally sent from the harbours of the Volga, 53,000,000 pouds; of the Kama and its tributaries, about 24,000,000 pouds; of the Soura, 5,000,000 pouds; of the Oka, 3,500,000 pouds; and of Vologda, nearly 3,000,000 pouds.

The principal points of destination are, St. Petersburg, 36,042,000 pouds; Rybinsk, 18,901,000; Nizhni-Novgorod, 7,577,000; Yaroslav, 4,824,000; Astrakhan, 3,340,000; and Archangel, 3,066,000 pouds. The greatest part of cereals, carried by the Dnieper-West-Dvina-Neman-Vistula system, namely 32,650,000 pouds, or 91 per cent of the total transport, principally goes from the harbours of the Dnieper, of the Kherson, Taurid and Ekaterinoslav governments. The principal points of destination are Kherson, 27,000,000 pouds, and Kiev, 2,500,000 pouds.

Of kerosene, naphtha and naphtha products, 56,432,000 pouds are transported yearly, on the average, by water ways; of this quantity raw naphtha forms 39,000,000 pouds; 55,035,000 pouds or 97·5 per cent are carried by the Volga-Neva-North-Dvina-Onega system. The goods principally go from Astrakhan and the most important points of designation are, Tsaritsin, whereto 16,011,000 pouds are transported; Nizhni-Novgorod, 16,662,000 pouds; Saratov, 4,131,000 pouds; Samara, 1,408,000; Kazan, 2,482,000; Yaroslav, 957,000; Riazan, 746,000 and St. Petersburg, 691,900 pouds.

The transport of salt by water, forms on the average about 23,221,000 pouds, of which 20,445,000 pouds, or 88 per cent, go by the Volga-Neva-North-Dvina-Onega system; and 2,614,000 pouds, or 11·3 per cent, by the Dnieper-West-Dvina-Neman-Vistula system. Salt, carried by the first of these systems, is principally produced from the salt mines in the governments of Astrakhan and of Perm. In the former 6,518,000 pouds, and in the latter, 13,152,000 pouds are produced. It goes from the following harbours:

on the Volga: Astrakhan, 1,326,000 pouds and Vladimirovka, 5,192,000; on the Kama: Lenvensk, 931,000 pouds; Berezniakovsk, 2,241,000; Ousolsk, 5,665,000 and Dedukhinsk, 1,278,000 pouds; on the Ousolka, Solikamsk, 1,278,000 pouds. The principal points of destination are, Nizhni-Novgorod, to which 3,014,000 pouds are transported; Tsaritsin, 2,846,000; Saratov, 1,241,000; Rybinsk, 973,000; Yaroslav, 816,000 and St. Petersburg, 595,000 pouds. By the Dnieper-West-Dvina-Neman-Vistula system, 2,158,000 pouds are transported from the harbour of Ekaterinoslav on the Dnieper and go to: Kiev, 550,000 pouds; Pinsk, 197,000; Viatka, 171,000; Mogilev, 145,000; Mozyr, 86,000 and Kherson, 71,000 pouds. The remaining quantity goes to other points.

The transport of unwrought iron, tin and steel forms, on the yearly average, 15,318,000 pouds, of which 13,246,000 pouds, or 84·4 per cent, are carried by the Volga-Neva-North-Dvina-Onega system; 1,828,000 pouds, or 12 per cent, by the basin of the Don; and 242,000 pouds, by the Dnieper-West-Dvina-Neman-Vistula system. The principal quantity of iron, transported by the first of these systems, comes from the Ural metallurgical works, situated in the governments of Perm, Ufa, Orenburg and Viatka, and is sent by the Kama and its tributaries. The principal points of destination are, Nizhni-Novgorod, to which 7,274,000 pouds are conveyed; Tsaritsin, 1,253,000 pouds; Rybinsk, 422,000; Saratov, 311,000; Yaroslav, 189,000; Kazan, 155,000; Samara, 145,000 and St. Petersburg, 266,000 pouds.

The transport of unwrought cast iron is 4,455,000 pouds, of which 4,046,000, or 91 per cent, are transported by the Volga-Neva-North-Dvina-Onega system. The principal transports go from the harbours of the Kama and its tributaries, and are generally designated for Nizhni-Novgorod 711,000 pouds, and St. Petersburg 554,000 pouds.

The yearly average transport of stone coal is 3,541,000 pouds, of which 2,468,000 pouds, or 69·6 per cent, go by the Volga-Neva-North-Dvina-Onega system; 754,000 pouds, or 21·3 per cent, by the Dnieper-West-Dvina-Neman-Vistula and 255,000 pouds, or 6·4 per cent, by the Don. The principal transports, about 2,000,000 pouds, go by the Kama and its tributaries; and the remaining quantity, 416,000 pouds, from St. Petersburg. The principal points of destination are the harbours of the Volga: Samara, to which 931,000 pouds are conveyed; Batraki, 430,000 pouds; Kazan, 157,000; as also the harbours of the Neva and the Izhora, 411,000 pouds. By the Dnieper-West-Dvina-Neman-Vistula system 683,000 pouds are transported from the harbours of the Dnieper; of that number 520,000 pouds go from Ekaterinoslav and 78,000 pouds from Alexandrovsk. The principal points of destination are: Rzhischev, to which 125,000 pouds are conveyed; Kremenchoug, 114,000; Kherson, 99,000; Kiev, 98,000 and Kovno, 50,000 pouds.

The transport of different fish, including herring, amounts yearly on the average to 12,726,000 pouds, of which 10,769,000 pouds, 84·6 per cent, go by the Volga-Neva-North-Dvina-Onega system, and 1,647,000 pouds, or 12·96 per cent, by the Don. The principal transports go from Astrakhan, 9,500,000 pouds and Archangel, 500,000 pouds. From Astrakhan the greatest quantity of fish, namely, 5,525,000 pouds, go to Tsaritsin, whence they are transported by railway to other towns. Thus, Nizhni-Novgorod gets about 1,783,000 pouds; Saratov, 639,000; Rybinsk, 199,000; Veliki-Oustiug, 178,000 and St. Petersburg, 129,000 pouds.

The transport of spirits amounts to 645,000 pouds, of which 460,000 go by the Volga-Neva-North-Dvina-Onega and 116,000, by Dnieper-West-Dvina-Neman-Vistula systems.

Of lump and granulated sugar 1,692,000 pouds are transported, of which 688,000 pouds, or 40·7 per cent, go by the basin of Don; 532,000 pouds, or 31·4 per cent, by the Dnieper-West-Dvina-Neman-Vistula system; and 472,000 pouds, or 27·9 per cent, by the Volga-Neva-North-Dvina-Onega system.

The principal transports go from the harbours of the Dnieper, such as: Cherkassy, 277,000 pouds; Rzhischew, 46,000; Kiev, 53,000 pouds. The principal points of destination are Ekaterinoslav, where 128,000 pouds of sugar are yearly conveyed, and Kremenchoug, 34,000 pouds. Also considerable quantities of sugar are transported from Nizhni-Novgorod, 183,000 pouds and Yaroslav, 127,000 pouds, from where the sugar principally goes to the harbours of the Kama, of which to Perm alone 160,000 pouds are conveyed. On the Don, sugar comes from Rostov, whither it is brought in coasting ships from Odessa; from there it proceeds by different railways to other localities, and only several thousand pouds remain in the harbours of the Don for local consumption.

Cotton is exclusively transported by the basins of the Volga and of the Don. By the former, 1,510,000 pouds, or 97·8 per cent; and by the latter 34,000 pouds, or 2·2 per cent, are conveyed. The principal transports go from Astrakhan, 1,200,000 pouds and Samara, 50,000 pouds. And the points of destination are: Nizhni-Novgorod, where 483,000 pouds are brought; Yaroslav, 295,000, and in 1891, 650,000 pouds; and Tsaritsin, 317,000 pouds.

Of flax seed 7,211,000 pouds are transported, of which 6,413,000, by the Volga-Neva-North-Dvina-Onega system. The principal transports go from the harbours: of the Volga, 2,600,000 pouds; of the Kama, 1,600,000 pouds, and of its tributaries, 1,000 pouds; mostly from the governments of: Samara, 1,900,000 pouds; Perm, 1,575,000; Viatka, 1,200,000; Yaroslav, 420,000; Nizhni-Novgorod, 350,000 pouds. About 485,000 pouds are shipped from the harbours of the Oka and its tributaries; and 300,000, from those of the Soura, in the government of Simbirsk. By the basins of the Neva and North-Dvina about 400,000 pouds are yearly transported, of which 320,000 from the government of Vologda. The principal points of destination are: St. Petersburg, where 4,356,000 pouds are brought; Rybinsk, 2,397,000; Archangel, 275,000; Yaroslav, 113,000 and Mourom, 104,000 pouds. From the harbours of the Dnieper 350,000 pouds of flax seed are transported; from the government of Taurid, 90,000; of Kherson, 150,000 and Ekaterinoslav, 220,000 pouds; from the harbours of the West-Dvina, 82,000 and of Neman, 105,000; all of which are bound for Kherson, Riga and Yurburg.

The transport of flax and tow amounts to 1,359,000 pouds, of which 1,274,000 go by the Volga-Neva-North-Dvina-Onega system. The principal transports are from the harbours of the Kama, 500,000 pouds; its tributaries, 280,000; and the North-Dvina, 220,000 pouds. The principal points of destination are: Rybinsk, where 464,000 pouds are brought; St. Petersburg, 188,000 pouds; Archangel, 171,000; Nizhni-Novgorod, 71,000; Kostroma, 44,000; Kazan, 29,000 and Vologda, 20,000 pouds.

The freight rates fluctuate according to the amount of business, as also to the state of the water and fair-way. The distance of the transport is of little consequence.

The most important are the freights on breadstuffs, which in 1891 were as follows: on the Volga, below Rybinsk, the freight on cereals, transported in steam tugs, going up stream was  $\frac{1}{253}$  kopeck per poud per verst; going down stream,  $\frac{1}{296}$  kopeck; by rafts,  $\frac{1}{355}$ . Above Rybinsk, by means of horse towing up stream,  $\frac{1}{73}$  kopeck, and by windlass and capstan towing,  $\frac{1}{80}$  kopeck; on the Kama, by means of steam tugs, with the current,

$\frac{1}{242}$  kopeck; on the Oka, by raft,  $\frac{1}{36}$  and in steam tugs, up stream,  $\frac{1}{59}$  kopeck; on the West Dvina, with the current and with oars,  $\frac{1}{44}$  kopeck; on the Dniester to Odessa, by steam tugs down stream,  $\frac{1}{51}$  kopeck; on the Dnieper, below the cataracts, to Odessa, on sails and steam tugs, going down stream,  $\frac{1}{82}$  kopeck; and above the rapids, by rafting,  $\frac{1}{38}$  kopeck; and by steam tugs, against the current,  $\frac{1}{49}$  kopeck; on the Don, against the current, with the aid of horse towing,  $\frac{1}{72}$  kopeck, and with the current, as far as Rostov,  $\frac{1}{100}$  kopeck per poud per verst.

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## CHAPTER XVII.

**Household industry.**

The reasons which influenced the development of the household industry; distribution of labour in that industry; different household trades; the principal materials used; different ways and means of production; money earned by peasants in the different branches of the trade; economical importance of the industry; total earnings of peasants occupying themselves with household trades.

**A**RICULTURE does not always sufficiently support the peasant population of Russia. Therefore, in many localities, especially in such where the soil is not fertile, the peasants, when free from field works, occupy themselves with household trades. These occupations give the peasants considerable earnings, and serve sometimes as the only means for the existence of their families.

In the household industry, besides the master himself, the other members of the family also take part; the sons begin to help their fathers when they are only 7 to 10 years old. In some industries, such as lace making, weaving and the like, the women predominate. In that trade the labour is often distributed between the different members of the family, and certain parts of the work are done by children and the aged. Sometimes one or two workmen, not belonging to the family, are also engaged in the trade and they earn equally with the members of the family. Owing to the low value of peasant labour and of materials used in the household industry, and to the great competition among the peasants occupying themselves with the same trades, the peasant workmen, *kustari*, sell their productions at very low prices.

There are very different household trades in Russia, their number amounting to about fifty, and are divided into the following five groups: the manufacture of: a. vegetable materials; b. animal products; c. minerals; d. metals; e. mixed productions, made of different materials. The vegetable materials are, principally, wood, flax, hemp and cotton.

In the non-Chernoziom region of Russia forests occupy an extensive area and give the peasants material for different manufactures, which can be divided into several categories, according to the different methods of their production. To the first category belong such industries as are founded on mechanical manufacture of wood; such are the carriage, cooper, and joiner industries, the making of baskets, and the like. To the sec-

ond category belong industries, founded on chemical manufacture, dry distillation of wood, such as the making of pitch, tar, potash et cetera.

In the first category the principal is the carriage industry, that is, the making of wheels, carts and sledges. This industry is practised by more than 20,000 households in European Russia. Each peasant family consists on the average of three grown up workmen, all of whom take part in some of the household trades. The production of the above mentioned articles is very extensive, as every peasant family needs carts and sledges; but as the latter are rather heavy and cumbersome it is not convenient to transport them great distances for sale.

The peasants have no convenient buildings in which to make wheels, carts and sledges; in summer they work under sheds; and in winter, in the cottages where they live. The most complicated of these industries is the making of wheels. This work is divided into several parts, each of which is done sometimes by separate workmen. Thus, where a peasant has several workmen and apprentices, one workman prepares the hub and felly, another planes the spokes and the master himself sets the spokes and tires and finishes off the wheel. The tires are bought ready made. The wood material needed in the wheel, as well as in other industries, is either bought by the peasant at the market, or at the neighbouring estates. The wheels and carts are sold either at fairs or bazaars.

The cooper industry consists in the making of barrels, tubs, pails and other wooden vessels. Coopers may be met with in many Russian villages, as their productions are indispensable for every peasant household; besides, barrels are wanted in wine-distilleries, sugar, tar, pitch and other works. About 14,000 peasant families occupy themselves with this industry, which is practised in the following way: oak wood is sawn into blocks, of the same length as the barrel is to be; these blocks are then rived, cut into staves of equal thickness and left to dry in the air. The hoops are made of young growths, and early in spring. This industry is especially practised in autumn after the field works are done. A workman can make in 16 hours from 1 to 4 casks, dependent on the size; during the whole season a workman makes from 50 to 200 casks, earning on the average 30 to 40 kopecks per day. Sometimes the coopers sell their manufactures at the bazaars, and in the northern Volga governments they are bought by middlemen, who transport them to wholesale dealers in the southern Volga governments.

Cabinet making and joinery consist in the making of furniture, boxes, drawers, weaving looms, window frames, doors, and the like. The greater part of the cabinet makers make common furniture; only in some regions of the Moscow and Viatka governments there are some very artistic workmen, who make valuable pieces, used by town inhabitants. There are about 10,000 peasant families engaged in carpentry.

The conditions of cabinet making differ from the other wood industries. In making furniture for towns the joiner must follow the fashions; moreover, he has to get valuable material of foreign wood. Therefore, besides the household workshops there are many with hired workmen. The latter receive in such village workshops, 40 to 80 roubles a year, according to their skill; moreover they are boarded by their masters. The latter, when they have only two or three labourers, work together with them, but when the number of workmen amounts to five, then the master does not work himself, but only superintends the work. In some localities of the Viatka government the net profits of a

cabinet maker, who makes common furniture, varies from 90 to 100 roubles a year, and of such as make town furniture, from 100 to 500 roubles. A cabinet maker works 13 to 14 hours a day.

A great quantity of common, as also of bent furniture, principally made of the branches of the wild cherry tree, is prepared in the north-eastern governments of the Volga and goes to the fairs of Siberia and by the Volga to the towns on the lower reaches of that river. A dozen of bent chairs is sold at 6 roubles, and of armchairs, 8 to 12 roubles.

Plaited articles play a great part in the household industries. These goods consist in baskets, mats, bast shoes and others. About 10,000 peasant families work at the production of these articles. Baskets are principally plaited of coarse twigs, of roots and splints, and are used for transporting different goods. During late years, however, the peasants of the Moscow government make fine plaited articles, according to foreign samples. A basket-maker earns from 25 to 60 kopecks a day. In the government of Tver, where baskets are made of pine branches, a workman gets 17 to 18 roubles per hundred; he can make about 400 pieces a year and consequently can earn about 70 roubles.

The production of mats is of great importance in Russia, as they serve for packing different goods. This industry is especially developed in the north-east of Russia, in the governments of Kostroma and Viatka. Peasants make mats by order of local merchants, who furnish the bast to the workmen. Both men and women are engaged in the industry, either in their own cottages, or in special workshops. A workman, with two helpers, can produce 15 pieces of matting, and earn about 40 roubles a year. Bags made of matting are of different sizes, sorts and qualities; they are sold to such warehouses and factories as deal in grain, flax, salt and the like, where they serve for wrapping up goods. It must be observed however that since linden trees, which give material for matting, are being no more planted, the production of bags in matting decreases rapidly. As the price of bast has risen, the manufacture of the above mentioned articles is no more profitable; they are therefore very little produced by the peasants, but are made in factories, belonging to rich owners.

The making of pitch and tar are the principal branches of the dry distillation of wood. The first is much developed in northern and north-eastern Russia, the governments of Archangel and Vologda; and the latter in the Volga manufacturing region, in the governments of Tver, Yaroslav, Kostroma and Kazan. There are more than 12,000 peasant families producing tar and pitch.

Pitch is made from trunks, roots and sometimes from fallen pine trees; tar is produced from birch bark; very often the peasants make a mixture of birch tar and pitch; this mixture is then called *polovin chaty degot* (half-tar). Pitch is distilled principally in pits; during late years, however, the peasants boil it in ovens, kettles and in standing or lying retorts. The primitive method of distillation gives, besides pitch, only charcoal; but when pitch is boiled in kettles or alembics, turpentine is also produced. Pitch and coal are sold by the peasants either at bazaars, or to forest-dealers, who resell them on distant markets. Pitch is principally used for smearing vessels. During late years it has been substituted, as a coating product, by articles of naphtha production, therefore, the price of pitch is falling, and with it decreases its manufacture.

The peasants, who boil pitch, earn only about 30 roubles per season, and not more than 20 to 30 kopecks a day. Tar is distilled in small factories, in retorts; the primitive method is now quite abandoned. It is produced from birch bark, cut in May or June, when the tree is full of sap. From 4 pounds of bark 1 pound of tar is distilled. An owner of a factory which contains two retorts, makes yearly 30 to 60 roubles net profit; and one, possessing a six-retort factory, 90 to 170 roubles. The conditions for the sale of tar are the same as those for pitch.

Admitting that the yearly quantity of tar and pitch produced by a peasant family amounts to 100 pounds, the total of the two products would be about 1,200,000 pounds. The making of small wooden articles, such as bowls, spoons, spades, rakes, salt cellars, weaver sleyes and the like, occupies a prominent place in the household industries, as they are very much used by the peasants. About 8,500 families occupy themselves with this industry.

Of the greatest interest is the spoon manufacture in the government of Nizhni-Novgorod. Here more than 15,000,000 spoons of different sorts are produced. A spoon-maker earns from 15 to 20 kopecks a day; and only very artful workmen, from 60 to 70 kopecks. The peasants sell spoons to agents at the low price of 2 to 3 roubles per 1,000 pieces.

Of the other vegetable materials, besides wood, the peasants use flax, hemp and cotton. The spinning of thread and the weaving of linen, towels, tablecloths and other fabrics, are much developed in Russia. Very often, however, the above mentioned goods are made only for home use, and therefore have no trade importance. Nevertheless some peasant women weave such a quantity of linen during the winter, that after satisfying all the wants of their families, they are able to sell the surplus. Only in such regions where much flax and fibre is produced, cotton goods are made for sale. In some localities of Russia the weaving is done by men; in others, by women, according to circumstances.

Flax is generally spun according to the primitive method, on hand spindles; very few use the spinning-wheels of Russian or Dutch systems. With the aid of a special reel, called *motovilo*, the yarn is wound into skeins of a definite length. Yarn thus prepared, bleached or not, is either sold or used for making stuffs, and which are woven on primitive looms; and only in some localities, on improved machines, called *samotolet*.

Yarns and tissues are bleached in common lye of ash, without any chlorine. Thus bleached tissues are not very white, but very solid. The peasants dye them very often either blue, indigo, or red. In the principal regions of the industry, the governments of Yaroslav and Kostroma, the peasants do not prepare the yarn themselves, but buy it ready made from factories through agents.

Linen and other tissues are woven in special rooms, called *svietelka*, which are built by several peasants together at the end of the village. Some peasants, however, work in the cottages in which they live. A good weaver, man or woman, can make per week a piece of linen, 50 arshines long. The weavers receive different pay, dependent on the width and fineness of the cloth; they earn per working season from 70 to 100 roubles. In general, women weave the narrower and coarser linen cloth, men weaving the larger and finer, the working of which is more difficult; therefore the earnings of the men weavers exceed those of the women.

The linen cloths produced at the Russian manufactories are not of a higher quality than those made by the village workmen (*kustars*), and with regard to the finer sorts they must even cede them the preference; but as machine-made linen cloth is 10 to 12 per cent cheaper than the hand-made, the latter industry will have soon to undergo a crisis.

Of the hemp goods the making of fish nets claims attention. The chief centre of the net-knitting manufacture is the government of Nizhni-Novgorod, where over 50 villages are engaged in the industry. Nets are knitted of yarn twisted of 2 to 8 and more threads; the dimensions of the meshes vary greatly, and according to the existing custom they are measured by the hand, namely by the number of fingers or palms that can be freely passed through the separate openings. Persons of both sexes and of all ages are occupied with the knitting of nets. In this industry a division of labour exists: some of the workmen twist the yarn, others do the knitting; these occupations are sharply separated and never concentrated in the same hands. Between the large firms dealing in fish nets, and the *kustars*, exist middlemen. They receive orders from the said firms and transmit them to the *kustars*, furnishing the latter also with the necessary material. For the twisting of the yarn the workmen receive 25 kopecks per poud; during the year several hundred pouds of yarn are worked.

Out of cotton the peasants, on the order of manufacturers, offices and commissioners make different tissues, such as, *sarpinka*, ticking, *roussinet* and the like, as well as sashes, braids et cetera. These cotton fabrics are worked by the *kustars* either at their homes or in small factories (*svietelki*) where from 10 to 20 looms are placed. The warp and the weft, both machine-made, are received by the peasants from the manufactories through the intermediary of like commissioners as exist in the linen cloth industry; the ready wares are forwarded to the orderers as soon as they are finished. In the cotton weaving manufacture an ordinary weaver, receiving from 1·5 to 2·5 kopecks per arshine of tissue, earns during the winter not more than 15 roubles; good workmen earn from 40 to 50 roubles. In the government of Saratov, where the *sarpinka* is mainly worked, weavers earn from 33 to 45 kopecks per day, and from 50 to 60 roubles per year.

The leather goods produced by the *kustars* are not very various. Besides the dressing of the hides, which is done in a very primitive manner, boots and shoes are made by the *kustars*, warm clothing from sheepskin (*touloupy*, *shouby* and *poloushoubki*), saddler wares, *roukavitsy* (leather gloves), and the like, are also made by them. The boots and shoes made by the *kustars* are chiefly of the most ordinary sort worn by the peasants; in some of the manufacturing regions, however, as in the government of Tver, boots and shoes for town wear, for men, women and children, are made. The trade of boots and shoes is organized as follows: there are more or less large special workshops with hired workmen; a considerable number of peasants work at their homes for such workshops; some of the makers work with their families on their own account. The shoemaker trade is reckoned to be more profitable than the other branches of the household industry, as shoemakers earn from 30 kopecks to 1 rouble per day. The boots and shoes are bought on the village markets, bazaars, by the middlemen and spread over all Russia. A very large quantity of such makes are sold in the shops of St. Petersburg and Moscow.

Owing to the climate the Russian peasants are in need of warm clothing, which

is made of sheepskin. Therefore village workmen produce yearly several million pieces of such clothes. The sheepskins necessary for the making of the *shoubi* (pelisses) and *poloushoubki* (short pelisses) are bought by the larger firms in south-eastern steppe governments, where coarse-wool sheep are bred on a large scale, or at the fair of Nizhni-Novgorod; the gray sheepskins worked in Romanovo, government of Yaroslav, are reckoned as the best. The working of sheepskins is done as follows: first, they are broken, then left to ferment for 3 to 8 days in special vats; after this they are dried, then broken again with iron hooks and whitened with chalk. The whitened sheepskins are tanned in tanning vats with oak bark. After the tanning they are again dried and broken. In general the working of sheepskins is hard and complicated. A finished dressed sheepskin is sold 15 to 20 kopecks dearer than a raw undressed skin. A workman can dress a hundred sheepskins per month and thus earn 20 roubles; the expenses of the work being 4 roubles per hundred, his clear profit will be 16 roubles. Ready sheepskins are sold by the small makers at the local fairs (bazaars); large dealers send their wares to towns and especially to the fair of Nizhni-Novgorod. Over 38,000 of peasant households are engaged in the dressing of hides and sheepskins.

From the various sorts of wool the kustars manufacture cloth and different kinds of felt goods, such as warm boots, felting, hats, collars, saddle cloths, thin felt et cetera. The best kind of cloth is made in the Daghestan district in the Caucasus, where cloths of various qualities are worked from the wool of the local sheep, of the camels, and of the down of the goat and the argali. The cloths made at Daghestan are narrow, 8 ver-shocks, and short, 16 arshines per piece, but very good; their prices are comparatively high; white cloth is dearer than gray or black. In the Caucasus, women are exclusively engaged in the making of cloth. The sale of this cloth outside of the Caucasus is very limited.

Warm peasant boots and shoes are, like the warm peasant clothing, made exclusively by the kustars, the quantity of the output reaching several million pairs. This industry is most widely spread in the government of Nizhni-Novgorod. For the making of felt boots, wool of different domestic animals, of various kinds and preparation is used, namely wool cut from live animals and that taken from sheepskin after it has fermented (*kisslaia*). The larger dealers buy the wool at first hand at the Fair of Nizhni-Novgorod and resell it to smaller makers at higher prices. Wool of different qualities is used in the making of boots, and the mixing of different kinds of wool is the hardest work in this industry. First, the wool is assorted according to its length and colour, then it is felted; out of the felt, boots are made; the felting of the boots is done on high wooden tables with the elbows of the workman. The felted boots are boiled in kettles and after certain successive technical operations they are finished off. The working of felt boots is carried on in separate uninhabited rooms. Some of the makers engaged in this industry are independent masters hiring workmen, who either are dependent on their masters and live at their houses, or take the work to their own homes and receive the necessary material from the masters. The more well off masters have regular workshops with 5 to 15 workmen; moreover, they give work out to a certain number of peasants in the villages. Workmen living at the master's house earn from 1·80 to 2·50 roubles per week, or 40 kopecks per day; workmen, working on their own account, earn from 70 kopecks to 1 rouble per day. The felting household industry is purely Russian and has gained a certain degree of perfection;

good makers have received honourable mention at the European world's expositions. The chief market for this kind of wares is the Fair of Nizhni-Novgorod, at which the larger dealers have their own shops and the smaller sell their goods to the tradesmen of the town. A part of the felt wares are sold at the village fairs and bazaars. Over 14,500 peasant households are engaged in the making of different woollen goods.

Of the other articles produced by the kustars of materials of animal origin, the weaving of silk presents considerable interest. This industry is spread in the governments of Vladimir and Moscow; over 1,000 peasant households are here engaged in the making of velvet, plush, faille, ribbons and some other silken goods. The silk weaving industry is organized like that of linen and cotton weaving, as has already been mentioned. The work is carried on at small factories (*svietelki*) with from 10 to 12 looms and 2 to 3 spools. The *svietelki* are clean, very light houses, *izbas*, having windows opposite to each loom. Not every proprietor of such a *svietelka* works independently; for the most part the owners of such places weave for a large firm, which sets its looms in the *svietelka* and furnishes the owner thereof with the necessary material. In such case not only the family of the owner of the *svietelka* works therein, but also hired weavers, receiving salaries from the said firm. The owner of the *svietelka* receives from the manufacturer for the apartment and its heating, as well as for the superintendence of the workmen, an annual salary, or a certain per cent of the earnings of each weaver. Some firms establish their own *svietelki* in the villages. There are also workmen weaving at their own homes, upon their own looms, who receive the materials from the manufacturers. A weaver can produce daily from 1 to 1·5 arshines of velvet, and earn from 40 to 70 kopecks per day; the yearly earnings are from 120 to 200 roubles. The silken wares are mostly sold to the Moscow dealers.

Of the other wares, in the production of which materials of animal origin are used, different small articles of horn and tortoise shell, such as cigar cases, combs, apothecary wares, and the like, should be mentioned. The kustars of the government of Vologda are chiefly engaged in this branch.

Mineral substances used by the kustars are, clay, precious and ordinary stones. Clay is the predominant material; wares made of it enjoy a large sale not only among the villagers, but in towns as well. There are almost no factories in Russia for the working of ordinary earthenwares and the demands for such are satisfied by the village potters. Therefore, the pottery trade is spread wherever suitable clay is to be found. Sometimes clay is brought from afar, at distances of several tens of versts. Clay is extracted late in autumn or in winter, laid in piles and so freezes. Plates are made in the ordinary inhabited *izbas* on lathes with horizontal rollers of very simple construction, turned by the hand or by the foot. The furnaces in which the plates are baked are square ditches two arshines wide and 1·5 arshines deep gradually narrowing towards the bases; near the bottom of such a furnace an iron grate is placed under which the fire is laid. But even such furnaces, their price being about 5 roubles, are owned only by well to do potters; other makers form associations of 5 and 6 men to establish such a furnace, in which they bake their wares in turns. Plates are mostly made unglazed.

An average potter makes a cart load of pots per week which he carries to the neighbouring fairs or bazaars for sale. The price per cart load of pots varies according to the season from 2·50 to 3·50 roubles, this being the total weekly earnings of a potter out of which the cost of fuel and sometimes that of clay, not unfrequently bought, have

to be deducted. Thus a potter earns no more than from 2 to 3 roubles per week. The making of articles of stone, such as millstones, whetstones, and monuments, is not widely spread and has no importance whatever in the economical life of the people.

The working of precious stones, namely, the cutting and polishing them, also exists in limited dimensions, and that only in one locality, namely, in the Perm government in the Urals. Coloured stones of the Urals, such as jasper, malachite, rock crystal and others are used in the making of ornamental objects, such as paper weights, boxes, vases et cetera. Marble is used for monuments, washstands and some other articles. Wares made of coloured precious stones are sent for sale to the large towns. Over 10,000 peasant households are engaged in the working of the mineral substances of all three categories.

Metals furnish to the village workmen materials for the most various blacksmith and locksmith wares. Blacksmiths are found in nearly every more or less considerable village, but not all of them produce new articles for sale. Of the branches of the blacksmith industry the most widely spread has been the making of nails, but now the trade tends to decline, being supplanted by the machine-made wire nails. However, for some works, such as ship building, for instance, requiring large nails, the forged hand-made nail has as yet no rival. An average workman earns by the forging of nails from 1·5 to 2 roubles per week.

Of the locksmith wares the making of knives, locks and harness trappings requires mention. All kinds of knives, scissors and locks are made in the vast region of the Nizhni-Novgorod government; locks are moreover made in the government of Tula. In the locksmith industry the goods are specialized with regard to the localities and the kind of the work; at some villages knives are mainly made; at others, scissors; at others again, locks and so on; the work itself has also its specialization; thus, some workmen forge the blades, others finish them off, and still others put together the separate parts. The most ordinary knives are made of iron alone, but those of the common use have blades welded with Russian steel, morianka; only the highest sorts of knives are made, on the whole, of cast steel, mainly English. The workmen buy the necessary material at the local weekly bazaars. A village smith working locks and knives earns only about 2 roubles, and only the most skillful earn about 5 roubles per week. In the above mentioned region locks are made of more than a hundred different types. The wares are generally sold to middlemen, which spread them in the Empire, and even without its boundaries in Asiatic countries. The making of cutlery and locks, owing to a considerable fall in the prices of such wares, are now suffering a hard crisis.

The making of harness appliances in the Yaroslav government is comparatively in a better economical condition. The workmen making bridle bits, stirrups and like articles, earn from 5 to 7 roubles per week; these earnings are, however, subject to many fluctuations. The articles for the cavalry harness made by the kustars reach such a degree of perfection that they are sold by means of the middlemen to the best shops of St. Petersburg, and bought there by the cavalry.

Of the wire wares the making of fishhook by the kustars in the Nizhni-Novgorod government claims attention. In Russia the fish industry holds a conspicuous place in the popular economy and requires a considerable quantity of fishing tackle, among

which fishhooks are the most prominent. The kustars engaged in the production of these devices do not carry on the work independently; they work to order of the local masters, who have constant relations with the dealers in fishing appliances of the centres of the fish industry. In the making of fishhooks, the yearly output in which reaches 40 million pieces, to the value of 400,000 roubles, a division of labour exists; some of the workmen cut the wire for the hooks; others file the ends; others again sharpen them and make the barbs; still others bend the hooks and finish them off. The daily earnings of a kustar in this branch are from 10 to 30 kopecks.

Besides the above mentioned wares, house appliances, tea urns (*samovars*), trays, candlesticks, firearms and side arms, wire tissues, and some other articles, are also worked from metal by the kustars. On the whole 19,000 peasant households are engaged in the production of metallic wares. Of the industries of the last group (the mixed industries) the greatest interest is afforded by the painting of ikons, the making of lace, jewelry and toys.

The kustars of the two principal regions, the government of Vladimir and that of Kursk, are engaged nearly the whole year round in the painting of ikons, of which 1,500,000 to 2,000,000 are yearly produced. The images, ikons, are painted on lime tree, alder and aspen boards, by boys, girls, adults and old men. Each family of 4 to 5 workmen, produces yearly not less than 3,000 ikons the total earning being from 200 to 240 roubles a year. The ikon a is painted by one workman, as in the government of Kursk, or it goes successively to many, as practised in the government of Vladimir; in the latter case the first workman only lays the ground on the boards, another paints the faces; the third, the hands and dress; the fourth write the superscriptions, and so on. Sometimes, only the faces and hands are painted and the remaining part of the image (the dress, crown et cetera) is covered with trimmings of stamped foil, *rizy*, variously ornamented. The painting of the images is very coarse, but that fact in no way impedes the spreading of this branch of household industry not only among the peasant population of Russia, but of that of Servia, Bulgaria and other Slavonic countries as well.

The manufacture of lace in which women are exclusively engaged, is spread in many localities of Russia; over 10,000 peasant households are occupied with the industry. The work is done in the *isbas*; the appliances for lace making are very simple and cost less than a rouble. Girls begin to work lace at the age of 8 to 10 years. The women not only make lace of different materials, such as linen thread, cotton silk and woollen thread, but they also make larger pieces, as shawls and dresses. The necessary material is obtained from the middlewomen, to whom the ready lace is also sold, and who peddle it over all Russia. The earnings of the lace makers are very insignificant; working 18 hours per day a woman earns 20 kopecks, and not more than 35 roubles for the whole season. On the whole approximately 15 million arshines of lace are made by the peasant women yearly, to the value of 2 to 3 million roubles.

The making of jewelry is also widely spread, the centre of the production being in the government of Kostroma. The industry consists in the making of different articles of gold, silver and brass, such as crosses, rings, signet rings, earrings, bracelets, brooches and the like. The work is carried on all the year round with a short interruption for field labours.

The peasant jewelers work either independently, buying the raw material and

selling ready wares, or they work to order, obtaining the materials from the orderers; or again they work on hire in other men's workshops. Peasant jewellers earn from 50 to 150 roubles per year. The articles of jewelry, owing to their cheapness, enjoy a large sale in the villages, towns and even in the capitals; the trade is carried on, as in the other branches of the household industry, by means of the middlemen.

The making of toys is chiefly spread among the peasants of the Moscow government, Moscow itself serving as a store place of this kind of wares for all Russia. Over 2,000 men are engaged in the manufacture of toys, the yearly output reaching 500,000 roubles. The toys are made of various sorts: a. of paper and mastic; b. of wood, turned and cut; c. of metals; d. of mixed materials. In general the toys are very coarse, but in return they are very cheap, thus being accessible to the poorest classes of the town population. In the technical part of toy making a wide division of labour exists; first there are two separate categories of workmen: some work only the white or unfinished wares, while the others finish them off; but besides this, all separate kinds of toys are made by special makers, some of them, for example, make only a special kind of animal, others make carriages or parts of carriages and carts, still others make doll heads and so on. The earnings of the village toy makers vary greatly; workmen not working independently but employed by the masters, earn according to their dexterity from 25 to 75 roubles yearly, the earnings of a woman being from 15 to 40 roubles per year. The independent small makers earn from 10 to 20 roubles per month. The wares are sold chiefly to Moscow direct by the makers or through middlemen.

Notwithstanding the generally small earnings of the kustars, the household manufacturing industry under the present conditions of household economy in Russia, is of a very great importance. The necessity of the industry derives plainly from the great amount of leisure of the rural population. Owing to the conditions of the Russian climate, work in the fields is active only during certain periods. Without the household industries a great quantity of time would be spent by the peasants to no profit; meanwhile over 75 to 100 millions form the yearly earnings of these kustars.

## CHAPTER XVIII.

**Manufactures from farm produce.**

Flour industry; starch and starch molasses\* .

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## THE FLOUR INDUSTRY\*\*.

THE Russian mills may be divided in two categories. The farming mills are to be found every where and they mainly answer the local wants by grinding local grain. The grinding process at such mills, owing mostly to the modest exigencies which the consumers present, especially with regard to rye flour, is very primitive and simple, the grain being ground in one batch, and the product not sifted.

The mills of the second category bear the character of manufactories and are mainly established for the grinding of wheat. Until the end of the sixties such mills were chiefly centred in regions having convenient and cheap means of communication for the bringing of the grain and sending of the flour, that is, along rivers and in the vicinity of manufacturing and trade centres. With the development of the railway network in Russia the flour industry ceased to depend on the water ways of communication, and mills began to be established along the railway lines. The introduction of the grinding by rollers instead of millstones abroad corresponds to this date. Russia did not stay behind the other countries with reference to the improvements made in the flour industry. In the end of the sixties the first mill with rollers for grinding flour was established in Russia, in Kazan by Romanov Brothers; this example showing brilliant results was soon followed by many large mill owners of the Volga region. The mills newly built along the railway lines were also of this improved type.

The profitableness of the new system of grinding, which enabled one to recover in 3 to 4 years the money spent for the establishment of the mills, the large credit afforded for the business, owing to which mills could be built without proper means and the debt contracted for the purpose paid off in a short space of time out of the income of the mill, called forth a feverish activity in the rebuilding of old mills according to

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\* Only such manufactures of farm produce are treated here as have not been described in Vols. I and II, *Manufactures and Trade*, of this series.

\*\* See Volume I, of this work: *Manufactures and Trade of Russia*, Chapter XIX.

the new pattern, as well as in the construction of a series of new mills mainly having steam motors, as no geographical and topographical conditions could longer influence the existence of the mills. Thus new flour-grinding regions gradually arose, and the number of mills and the quantity of flour produced increased also. However, notwithstanding the latter fact, the sale of Russian flour was almost exclusively limited to the interior markets, and the foreign export of grain in flour in no way increased, but even gradually decreased.

This state of affairs necessarily led to over production and in the middle of the eighties Russia had to undergo a crisis in the flour industry, which was still more aided by the fall in the prices for breadstuffs in 1884; the sale of flour came to a standstill, and large stores of it remained unsold, or were sold at a loss. All these reasons retarded necessarily the development of the flour industry; since 1884 a decrease in the production is to be noticed, mostly reflecting upon the mills of the Volga region and on those of some of the milling districts of the central Chernoziom governments of Russia.

Passing to the statistics of the flour industry in Russia it should be first stated that there are no data whatever referring to the farm mills, the existing data relating chiefly to the mills of a manufacturing character. Therefore, in order to obtain an approximate idea of the dimensions of the Russian flour trade in general, and of those of the production of the farm mills in particular, general considerations should be given to various subjects relating thereto, such as, the amount of the crops of rye and wheat in Russia, the quantity of grain used for seed, the dimensions of the foreign export, as well as the quantity of rye and wheat used in manufactures. On comparing such average data for a sequel of years it will be seen that Russia consumes yearly 82 million chetverts of rye and 18 million chetverts of wheat in the form of bread. Thus at all the Russian mills about 100 million chetverts or about 920 million pouds of grain are yearly ground into flour. If the flour obtained be reckoned to equal 80 per cent, the yearly production of it may be fixed at something near 740 million pouds. Not over 140 million pouds thereof are produced at the mill manufactories, their number being about 5,000; thus the greatest part of the flour, namely about 600 million pouds is ground at the farm mills.

According to the existing statistics of the mill manufactories and the investigations carried on in some of the milling regions, it may be concluded that the flour industry of Russia is chiefly centred in the mills of the Volga region, their production forming 40 per cent of the total; in the mills situated in the central Chernoziom and non-Chernoziom governments of Russia, their product equalling 17 per cent; in the mills of the southern and south-western region, forming 9 per cent of the whole production.

On the upper reaches of the river Volga the flour industry has been established since long ago, owing to the convenient means of carrying the grain from the south and to the vicinity of such large centres of consumption as St. Petersburg and Moscow. At the present time nearly all these mills are using rollers and have perfected machinery. The water motors, in case of their existence, have been reinforced by steam motors. The flour industry has especially developed in Nizhni-Novgorod and its nearest vicinity, where there are mills each grinding over 2 million pouds of grain yearly. On the average the mills of Nizhni-Novgorod can produce over 10 million pouds of flour per year. The second place is held by the mills of Kazan, Kostroma and Rybinsk (govern-

ment of Yaroslav) over 3,000,000 pouds are ground at the mills of each of these regions. The Novotorzhsk (government of Tver) Yaroslavsk and Tetushsk (government of Kazan) mills have a production of one million pouds each. The flour is sold mainly to the northern, north-western and north-eastern parts of Russia; the most important markets of consumption are the two capitals and Finland.

On the lower reaches of the Volga the flour industry began to develop with the construction of railways. Nearly all the mills are supplied with rollers and work by steam. The advantages of the mills situated in this region consist in that they can use the local grain of the highest quality and in that they are united by rail to the principal markets. The production of the large mills situated in Saratov is not much under that of the mills of Nizhni-Novgorod, in fact it amounts to 9 million pouds yearly. Then follow the Bousoulouksk mills, government of Samara, having a production of 2 million pouds, and those of Orenburg and Samara producing over 1,500,000 pouds. Furthermore, the Mayinsk and Nikolaevsk mills of the Samara government have also a considerable production. As markets for the sale of the flour produced in this region may be regarded mainly south-eastern Russia, the ports of the Caspian, western and south-western Russia, as well as St. Petersburg and Moscow.

The third region in which the flour industry has also reached a considerable development, is central Russia with its mills situated at Yelets, at Livny, near the station Sergievo of the Moscow - Kursk Railway, and at Serpoukhov. The development of the flour industry in this region dates from long ago owing to its advantageous geographical and topographical conditions. The local wheat, exclusively winter wheat, is renowned for its high quality; it is mixed with summer wheat brought by rail from the south. The flour is also carried by rail and sold in Moscow and to the west of Moscow, reaching the Vistula region, the latter forming also one of the principal markets. Over 9 million pouds of flour are produced in this region; Livny and Yelets produce 3 million pouds each; Sergievo, about 2 million pouds; and Serpoukhov, about one million pouds. The mills are of most perfect construction and are supplied with rollers; many of them have appliances of the newest invention, namely the flat sifting apparatus.

The southern region, comprising the governments of Kherson, Podolsk, Ekaterinoslav, Kiev, Bessarabia, Poltava and that of Tauride, has also a large production which at present exceeds by twofold the demands of the population of that region. The making of flour proves to be here a profitable business owing to the fact that almost the whole population, peasants included, eat mainly wheat bread, and therefore flour of a good quality is in demand. The profitability of the flour industry here may also be seen from the fact that the enlarging of old mills and the construction of new ones still continue, especially of late. The largest and most perfect mills are situated in towns. Odessa produces about four and a half million pouds; Rostov - on - Don, three and a half million pouds; Kremenchoug, Elisavetgrad and Ekaterinoslav, 3 million pouds each; Kiev, 2 millions; Sebastopol, 1,500,000, and Kerch about one million pouds yearly. The excess of the flour is sold, by the millers of the northern part of this region, to the Vistula and north-western governments, and partly to Moscow and St. Petersburg, by the millers nearer to the Black and the Azov seas, to the Caucasus, to the Russian ports of the Baltic, to the extreme east, and abroad.

Some large mills exist also in the Vistula region. The local demand is here very considerable, owing to the comparatively dense population, as well as to the fact that

the bulk of it appertains to the trade class of the towns, and not to the agricultural, rural class. The milling industry is especially developed in the government of Lublin. However, the Vistula region is not able to supply all the local demands for flour and has to bring a considerable quantity of it from the interior governments of Russia. Of the Baltic governments the one having the largest production of flour is Courland with Libau at its head. In the two other governments, Lithuania and Esthonia, there are no particularly large mills with rollers.

Besides the above mentioned regions, many large mills exist also in other localities of Russia especially in towns affording a large consumption or conveniently situated for the furnishing of the mills with grain and for the export of flour. Thus some of the mills, remarkable for their construction and dimensions, are situated in Kursk, Kharkov, Voronezh, and Smolensk. One of the Kursk mills sends its flour abroad although in inconsiderable quantities.

On the whole it may be said that the number of mills in Russia is larger than is necessary for home needs. The mills bearing the manufacturing character are constructed according to the latest demands of technic, and are capable of producing flour of the highest grade, and much better than that required by the bulk of the Russian population. In recent years with the development of these perfected mills, difficulties arise with regard to the sale of especially the high grades of flour; therefore, many of the mills have had to change the character of their produce, namely, to work in more considerable quantities the medium and lower grades than would seem to be necessary, according to the perfect construction of the mills and the high quality of the grain at the disposal of the millers. The sale of these lower grades is considerably more warranted in Russia as compared to the higher sorts, not so much because of the price as owing to the modest demands of the bulk of the population, which pays less attention to the aspect of the bread, that is, to its whiteness, than to its nourishing qualities.

Hence it would seem that owing to these conditions nothing would be easier to Russia than to ship the highest grades of flour, finding no ready sale in the interior markets abroad, namely to England, Belgium and Holland, countries where no duty is placed on grain in general, and no special duties on flour. However, it appears that precisely these countries also consume flour of higher grades in inconsiderable quantities, namely, for some special sorts of bread, and use chiefly the second and the lower sorts of flour for the baking of bread. Thus in England for instance, as a sample of flour, used for the bread consumed both by the rich and poor classes, the so-called household bread, may serve the Russian *pervach* (blue and red mark), that is, flour of second and third grades, or else the same sorts, the sale of which is quite warranted in Russia and at such good prices as would not be received abroad if they would be exported thereto.

The conditions of the United States of America are quite different, the population there being very particular as to the quality of the bread they eat. The highest grades of flour enjoy such a vast sale in America itself, and are sold so well that the profits thereof cover to some extent the expenses of the American millers in the production of the lower grades. Thus the second and third sorts, which are chiefly shipped from America to Europe, mainly to England and Holland, come to the market already paid for, so to speak; this explains the fact that the American flour is sold in these countries at prices lower than those at which the flour made there from the American grain can

be sold. If the English millers still find it profitable to uphold their business it is due to their using cheaper sorts of wheat than the American grain; of the latter so much is only taken as is necessary to give a glutinous consistence to the flour prepared from the English grain, as well as from the low quality grain of the other countries. But during recent years even the use of American wheat is not found to be as profitable to the millers as the buying of American flour and mixing it with that of their own manufacture. This is widely practised at all the mills of England, Belgium and Holland, thus explaining the always increasing export of flour, as compared to that of grain from the United States.

From Russia, flour is sent abroad in very inconsiderable quantities, namely about 2,500,000 pouds yearly. The export falls mostly to the south, and Odessa and Sebastopol are the chief points of shipment. The markets for it are European and Asiatic Turkey, Egypt and Great Britain. Turkey consumes the medium and lower grades of flour, and the other two countries, mainly the higher qualities. The sending of flour to Italy, France and Spain bears a casual character. The greatest activity with regard to the export of flour is shown by the mill of Veinstein in Odessa, which began the exporting business as early as 1863 and has a reputation so firmly established that its brands are bought in England according to the mark only, their quality being not inferior to the Hungarian flours nor their prices as high. About 60 per cent of the total export of Odessa falls to that mill.

In conclusion reference should be made to the character of the work at the Russian perfected mills. That of the southern mills is much like the high-grinding of the Hungarian mills. The mills produce 12 grades of flour and 3 of bran. The grinding is exclusively fine; groats as a finished product are not sold. On the Volga and in central Russia the highest grades of flour are sold as kroupchatchki (of groats), and only the pervachi and lower grades of flour are sifted through the № 10 sieve. The kroupchatchki are reckoned here to be more dry and giving a greater overplus of bread after baking, but such a statement may be questioned. It is true that the bakers of this region prefer the kroupchatchka, but it may depend as well on the fact that they are little accustomed to use more finely ground flour in the baking of bread. In the south, where the grinding of the higher grades of flour prevails, the bread is not inferior in quality to that baked in the north from the kroupchatchka, and the coarser grindings, although very easily managed at the mills with rollers, are not in demand. The kroupchatchki do not find markets abroad as well; they are exclusively produced at the mills of the Volga region and those of central Russia which have the same markets for sale. It must not, however, be thought that this method of work, and not the above mentioned conditions, impedes the sale of the produce of the mills situated on the Volga; the kroupchatki could be easily ground into finer grades and the millers could in general easily accommodate themselves to the demands of the foreign markets.

The cost of the grinding in Russia depends, of course, on local conditions and is different for nearly every mill, but on the average it can be fixed at one rouble per chetvert of grain, reckoning herein the cost of the maintenance of the buildings and the sinking of the capital invested.

## THE STARCH INDUSTRY.

In the last century wheaten starch was used mainly in the apothecary shops and for household needs, and the production of it was very feebly developed. But in time, with the increasing demands therefore, its production gradually rose and now over 1,500,000 pouds are yearly made in Russia, although this quantity is much under the productive capacity of the country in that respect. The making of pure starch in factories relates to the second half of the last century when an impetus was given to the production by the large demand for powder for the army. In the beginning of the present century this demand ceased altogether, but in return, owing to the prohibitive system of customs tariff, the cotton fabrics and chintz printing manufactures began to develop fast in Russia and are the chief consumers now of starch.

The government of Tver, namely the town of Kaliazin, must be reckoned as the birth place of Russian starch manufacture; this town was since long ago placed in the most favourable condition for the development of the industry. Situated on the Volga not far from Rybinsk, one of the chief centres of the Russian cereal trade, Kaliazin had always the means of buying grain at very moderate prices, and this was especially the case in former times when wheat, that had got wet, was chiefly used in the starch manufacture, starch being obtained by means of decomposing the grain; thus the fact of the establishment of the first starch manufactories in the vicinity of water ways of communication is easily explained. Being guaranteed with regard to the material used in the production of starch, Kaliazin was equally secured in finding markets for the product as the centres of the cotton weaving and chintz printing manufactures were not distant. Until the present time the town of Kaliazin remains the principal place as to the production of wheaten starch in Russia.

Developing gradually, the manufacture of starch spread in the governments of Moscow, Yaroslav and Vladimir where new wheaten starch works began to be established in the end of the twenties and the beginning of the thirties; and towards the end of the thirties the first manufactories for making starch from potatoes were organized in the governments of Moscow and Yaroslav; these factories produced mostly green starch to be worked into molasses and to some extent into dextrin, leiokome, and the like. In the beginning of the forties, owing to the raising of the duties on cotton, yarn and the permission given by England to export its cotton spinning machines, the number of Russian cotton spinning manufactories began to increase, greatly influencing thereby the development of the cotton weaving and chintz printing industries, calling forth a large demand for starch. New factories were established in the Moscow government and the adjoining governments of Tula, Vladimir and Yaroslav, as well as in Estonia and some other places. From this time the working of starch began strongly to develop, spreading itself more and more over the Empire; and in 1865, when with the end of the American Civil War and that of the cotton crisis, the Russian cotton business reached considerable dimensions, the number of starch factories according to official data was 59, with an output reaching 270,000 roubles for that year. It should be mentioned that the small household works were not included in this number. In 1874 the production of the starch factories rose to 800,000 roubles, again with the exclusion of the household works, and in 1880, according to official data, which were

by no means complete, there were already 224 starch factories in Russia the output of which during the year was over 600,000 pouds, to the value of a little less than one and one-half million roubles.

Of the data for 1890 it results that although the number of the works has decreased since 1880 by about 13 per cent, there being 284 factories in 1880, and 195 in 1890, still the quantity of starch produced increased more than two and a half times, being a little over 600,000 pouds in 1880, and over 1,600,000 pouds in 1890. The largest production of starch refers to the governments: of Yaroslav, 25 factories with an output reaching 321,000 pouds; of Tula, 29 works producing 305,000 pouds; of Kostroma, 16 factories yielding 197,000 pouds; of Riazan, 32 works with a production equalling 190,000 pouds; and that of Vladimir having 15 factories with a yearly output of 113,000 pouds of starch.

Speaking of the historical course of the development of the starch industry in Russia and comparing it to the present state of this branch of manufacture a highly interesting fact should be mentioned, namely, that in the beginning of this industry, starch was mainly manufactured from wheat, while now it is chiefly made from the potato. Therefore, the government of Tver, which formerly occupied the first place among those engaged in the starch industry, although keeping the first place with regard to the manufacture of starch from wheat in Russia, is still behind many of the other governments, with regard to the average output, for example, those of Yaroslav, Tula, Kostroma and Riazan, producing starch almost exclusively from the potato. Such an increase in the production of starch from potato, noticed already in the beginning of the sixties, is explained not only by the growth of the demands for starch leading to the research of new material fit for the production, but also to the fact that many of the landowners changed the old three-field system of cultivation to that of the many-field, in which the potato plays a conspicuous part, all the more so as it proved in many governments of Russia to give such high profits to the farmer as were never obtained from any cereal. If moreover it be considered that the making of starch from potato is much cheaper than that from wheat, although the quality of the product is inferior and enables the potato starch to compete with the Russian wheat starch as well as the foreign makes in cases where no particularly high quality is required, it will be clear why the potato starch is supplanting little by little wheat starch, which however is inferior in quality to the imported rice starch.

Besides potatoes and wheat, which serve as the principal materials in Russia for this manufacture, starch is made also from maize and rice but in such inconsiderable quantities that it has never had any influence upon the general state of the starch trade in Russia. The reason why starch is so little produced from maize and rice consists chiefly in this, that the localities of Russia, namely, the southern governments, where these cereals could be used with some profit in the manufacture of starch, are so far distant from the manufacturing centres that the transportation from there to the central governments, where most of the cotton weaving and other factories using starch are centred, is too expensive, and the sale of it on the spot is too limited. Moreover, the competition of the foreign makes reflects mainly on the southern governments as the chief import is carried through the southern ports.

With regard to the competition of the foreign with the Russian starch, it will prove of some interest to show its historical course in brief summary. The manu-

facture of starch in Russia, as has been already mentioned, has greatly developed during the present century and especially during its second half; in the mean time the demands for the article rose still more rapidly because of the large development of the industries in need of it, such as cotton weaving, chintz printing, linen cloth et cetera. The result was the excess of the demand over the output which called forth the increase in the import of foreign starch, especially from the sixties and eighties as proved by the following data. Until the sixties the import of starch to Russia was very inconsiderable, never exceeding 1,500 pounds; in 1869 it reached 60,000 pounds, and in 1880 it was already 191,000 pounds, thus increasing in eleven years almost threefold and forming at the same time about 30 per cent of the quantity produced during 1880 in Russia, that being about 600,000 pounds. In the following decade the import began to decrease, and in 1890 it equalled 112,684 pounds or 7 per cent of the total output of Russia for that year, reaching 1,610,900 pounds.

Considering the technical side of the production of starch it must be first mentioned, that the making thereof from wheat bears generally the character of a manufacturing industry, chiefly concentrated, as it is, in the hands of town tradesmen in Russia, while the making of starch from potato mostly refers to rural economy, the owners of such establishments being mainly landowners and peasants. The works of the latter generally are of the simplest construction, the production being of very small dimensions and carried on in the most primitive fashion; thus, it is the only one of the branches of the household industry which enables the peasants to sell their potatoes to some profit; in some of the localities, as in the Rostov district of the Yaroslav government, the work is not carried to the end at some of the household establishments; some of them work only raw starch which is sold on the markets or carried to the drying shops, or else sold as raw material to molasses factories.

The household establishments are generally small wooden buildings, and the different appliances necessary in the manufacture of potato starch, used in the washing and scraping of the potato, of sifting it through sieves to obtain the starch, which is then purified and dried, are, graters, vats for the washing and settling, et cetera, also mostly made of wood. Horses and oxen generally serve as motors. The small establishments of the landowners differ but little from those just described; but some of the estate owners are the proprietors of large factories which are much more perfectly organized, and which consist very often of massive stone buildings; more perfect methods of production are followed here; therefore, better apparatus and machines are used, moved by water or steam propellers. The amount of starch produced fluctuates greatly, namely from 10 to 20 per cent, dependent on the quality of the potato in that respect, and on the methods of working it.

As to wheat starch, different ways are adopted in its manufacture. The oldest method, now going out of use, consists in decomposing the grain, over which water is poured for that purpose, and which is then kept for some time in a warm place; after this, when the mass is sufficiently rotted, the starch left unchanged is mechanically separated therefrom, settled, washed and dried. This method was changed later on to the so-called sour-fermentation (*kisloie brozhenie*); according to this method the grain soaked in vats is crushed by means of small rollers, then mixed with water, forming a thick gruel-like mass, which is further distributed in wooden tubs and left to ferment; the fermentation is sour and even putrefactive, and the acids deriving from it dissolve

some of the gluten. The insoluble mass left is washed upon metallic or silken sieves or on special apparatus, and the starch dissolved in water is gathered in settling vats, purified again by washing, and then dried.

Besides these, so to say, chemical methods of obtaining starch from wheat, the Elsass and the Marten methods, consisting in the precipitation and settling of the starch from the mass of crushed grain (the Elsass method) or from a thick dough made of flour and water (Marten method) are also used. The proportions of the wheat starch obtained fluctuate, as those of potato starch, dependent on the methods of work, but they rarely exceed 45 per cent.

The residues of the starch industry are employed generally as fodder for cattle and are almost of no other use. The waters in which starch has been washed are sometimes used as manure for the fields, but in most cases is let out into channels and rivers.

In conclusion another application of starch, which is to some extent developed in Russia, deserves mention, namely, the production of brandy therefrom. The first experiments of this kind relate to the beginning of the seventies and were carried on in the government of Tver; since then the manufacture has been applied with varying success in 16 governments. At present the making of brandy from starch is chiefly spread in the governments of Riazan, Vladimir, Orel, Tambov and Tula, that is, in such where the manufacture of starch from potato is considerably developed. The number of factories engaged in the industry during 1890 to 1891 was 22, and 63,000 pounds of starch were thus used; the starch was mashed together with breadstuffs as being of the same standard. On considering the total amount of breadstuffs used in Russia for brandy it will be easy to conclude that starch has very little importance as a material for this kind of manufacture, in fact during the period from 1890 to 1891 it formed less than 0·2 per cent of the total amount of breadstuffs used in the making of brandy.

#### THE STARCH MOLASSES INDUSTRY.

The manufacture of molasses being very nearly connected with that of starch is, however, very much less developed in Russia, not only with regard to quantity, but also to quality. The owners of the molasses factories are now, as in former times, mostly tradesmen; landowners and peasants own very few of such establishments.

The first factory for the making of molasses was founded in 1826 in St. Petersburg by Shoulz, a foreigner. Soon other such works were organized in the Moscow and Yaroslav governments, whence it spread into other localities, so that according to official data there were in 1866, 133 factories in 22 of the governments having a yearly output of about 400,000 roubles.

Firstly, molasses was produced in Russia from potato flour by means of a filtered infusion of malt, but by and by that method, as being very unsatisfactory, was abandoned and supplanted by another in which the starch is transformed into sugar by the use of weakened sulphuric acid. However, this method in the way it is employed at most of the factories does not give a product of high quality. It depends on the fact that the greater number of the Russian molasses factories boil the mash over open fires, which does not allow any regulation of the temperature; therefore the transformation of starch into sugar is not uniform, and besides some of the molasses is burned, gains a dark colour and

savour of the burning. The boiling of the must by means of steam is carried on exclusively at large factories situated chiefly in the western region and the Yaroslav government. Besides the unsatisfactory method of boiling of the must, the Russian molasses works have another defect, namely, the evaporating process for the thickening of the produce is never carried to the fullest extent and rarely exceeds 35° Bomé. There are some steam factories where this process reaches 40 and more degrees Bomé, and which are using vacuum apparatus for this purpose, but their number is very limited. The light colour is given to the must by means of bone coal, which is added thereto during the boiling and at some of the factories it is equally placed on the filtré. The filtration is done mostly through linen cloth and only at some of the more perfected works special filtré presses are in use. The neutralization of the acid is brought about by using chalk, which is added to the must until it ceases to simmer. Very few factories are engaged in the manufacture of a higher product, namely in that of sugar from starch.

In general as has already been mentioned, the molasses industry is very feebly developed in Russia and if it formerly gave reasons to suppose it would increase, it was chiefly due to the high protection of beet sugar, owing to which the prices for such sugar rose considerably, and hence it appeared promising to substitute another and a cheaper product. The statistics show that the molasses industry has for many years not developed at all; thus, in 1878, 413,000 pouds of molasses had been produced; in 1879, 410,000 pouds; in 1880, 440,000 pouds, and in 1890, 470,900 pouds. The greatest quantity relates to the governments of Yaroslav (255,000 pouds produced by 6 factories), Perm, Kursk, Vladimir and Riazan.

Besides the production of molasses that of dextrin is also intimately connected with the starch industry. The working of such products as dextrin, obtained by means of the reaction of acids, chiefly azotic and muriatic, on starch, and leiocombe obtained by means of heating the starch from 170° to 200° Celsius, is very little spread in Russia. In fact this manufacture is chiefly centred in the starch works of the Yaroslav government. According to the data of 1890, 7 factories of that government were engaged in the industry, yielding 21,400 pouds of the product.

## CHAPTER XIX.

**Fish and other marine animals.**

Classification of fisheries; river and lake fisheries; sea animals; other water animals; methods of fishing; fishing implements.

**F**Ishery forms a very important branch of Russian Industry. It not only gives earnings to half a million of regular fishermen, but also to several millions of peasants who follow the occupation, when they are free from agricultural labours. Moreover, it procures healthy food for all the inhabitants of the Empire.

The Russians are natural fishermen, who from times immemorial have fished in the numerous rivers and lakes of Russia, which have always been abundant in fish. Therefore there is no other nation, possessing such numerous and various methods of fishing, some of which are very ingeniously invented and founded on the different conditions of existence and habits of the several species of fish.

The sparse population, the extensive forests, and uninhabited areas, have influenced in general the development of the fauna, and the abundance of fish in all the basins of the Empire. In ancient times the supply was so great that fish were of no value, so that only certain choice bits were used. Thus, in the lake Peipuss there were so many breams, that only their tongues were eaten; on the Volga and the Koura the bodies of huge sturgeons were thrown back into the rivers, after the caviar and the glue had been secured; the fish, called *chastikova*, was only used for the fat; of sanders, only as many were taken as could be sold, so that a large number of them were thrown back into the waters. On the Kouban, only 25 years ago, the water dipped up into barrels had to be strained through sieves, in order to free it from the young fish.

But little by little with the development of civilization, with the cutting down of forests and the ploughing and cultivation of the steppes and of the borders of rivers and lakes, with the development of factories and manufacturing industries, and with the increase of the population, the quantity of fish in the upper, and later on, in the middle currents of the rivers became more scarce. The fish trade gradually removed to the mouths of rivers, and further on, to the Sea of Azov and the Baltic. Thus on the borders of European Russia, extensive areas were devoted to fisheries which supply the population of the whole Empire with different products of the industry. Moreover, central Russia, especially its northern and north-western parts, as well as the localities beyond the Urals, rich in lakes and rivers, are until now supplied with fish from their own basins.

The fish trade may be divided into the following regions, according to the locality, the character of the population and the administration of the industry.

### I. CASPIAN REGION.

1. The Caspian-Volga fish district includes Volga, below Kamyshin, and the northern part of the Caspian Sea, with the exception of localities belonging to the Uralsk and Tersk regions.
2. The Caspian-Tersk district includes the mouth of the Terek, and the adjacent parts of the Caspian Sea, southward to the river Samour.
3. The Caspian-Ural district includes the river Ural, within the borders of the Ural region, and that part of the sea which belongs to the Ural Cossacks.
4. The Caspian-Koura district includes the river Koura with Akousha, and the sea, from the Samoura to the Astara.
5. The fishery of the south-eastern part of the Caspian Sea.

### II. AZOV REGION.

1. The Azov-Don fishery includes that of the river Don and the mouths of rivers in the territory of the Don Cossacks.
2. The Azov-Kouban fish district, to which belong the lower part of the Kouban with all the friths, includes also the Protok and the part of the sea which bathes the Kouban border.
3. The Azov district includes the Sea of Azov and the strait of Kerch.

### III. BLACK SEA REGION.

1. The Crimean-Caucasus fish region embraces the whole border of the Crimea, beginning with Eupatoria, the border of the Caucasus from the Kouban frith, to Batoum.
2. The Dnieper-Dniester region includes the north-western part of the Black Sea, from the Tendra island to the mouth of the Danube, the Dnieper-Bug and Dniester friths, with the mouths of rivers falling into them.
3. The Danube fishery includes the Kilisk branch of the Danube, with that part of the sea which lies before its mouths.

### IV. THE BALTIc REGION.

1. The Baltic fishery embraces the borders of the Baltic Sea, with the Riga gulf, the Western Dvina, Vistula and Neman, that is, those parts of them which are in the Russian Empire.
2. The Finnish fishery includes the southern and eastern borders of the Gulf of Finland with the rivers falling into it.
3. The Finland region embraces the Finnish and Bothnia gulfs, washing Finland.

### V. THE FROZEN OCEAN AND WHITE SEA REGION.

1. Mourman fishery.
2. White Sea Pechorsk fishery.

### VI. THE REGION OF LAKE AND RIVER FISHERY.

The following figures show the yearly quantity of fish caught in the different regions:

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## CASPIAN REGION.

## 1. The Caspian-Volga fishery.

	Pieces.	Pounds
White sturgeon (acipenser huso); common sturgeon (ac. güldenstaedtii); stellated sturgeon (ac. stellatus); shipa (ac. schypa). . . . .	—	600,000
Sterlet (ac. ruthenus) . . . . .	500,000	12,500
Belorybitsa (luciotrutta leucychthys) . . . . .	50,000	31,260
Herring (clupea caspia, cl. kessleri, cl. saposchnikovii) . . . . .	400,000,000	7,500,000
Vobla (leuciscus rutilus, var. wobla) . . . . .	400,000,000	6,600,000
Sandre (lucioperca sandra et L. marina) . . . . .	25,000,000	3,750,000
Bream (abramis brama) . . . . .	8,000,000	400,000
Carp (cyprinus carpio) . . . . .	2,000,000	240,000
Taran (leuciscus rutilus); sop (abramis ballerus); sinets (abramis sopa); razor-fish (pelecus cultratus); zherekh (aspis rapax); bersha (lucioperca volgensis) . . . . .	100,000,000	3,000,000
Perch (perca fluviatilis); krasnoperka (scardinius erythrophthalmus); tench (tinca vulgaris) . . . . .	20,000,000	1,000,000
Pike (esox lucius) . . . . .	1,000,000	100,000
Silurus (silurus glanis) . . . . .	180,000	180,000
Lamprey (petromyzon Wagneri) . . . . .	—	50,000
From this quantity of fish is produced:		23,463,760
Caviar from sturgeon. . . . .	—	40,000
» " all other sorts of fish . . . . .	—	400,000
Glue from sturgeon and silurus glanis . . . . .	—	5,000
Viaziga (dried spine of sturgeon) . . . . .	—	4,000
Cod liver oil . . . . .	—	100,000
Salted, dried and pickled fish. . . . .	—	15,000,000

## 2. Caspian-Tersk fishery.

White sturgeon (acipenser huso); common sturgeon (ac. güldenstaedtii); shipa (ac. schypa); stellated sturgeon (ac. stellatus) . . . . .	40,000	8,000
Salmon (salmo caspius) . . . . .	3,000	1,500
Shamai (alburnus chalcoides) . . . . .	30,000	4,000
Silurus (silurus glanis); carp (cyprinus carpio); sandre (lucioperca sandra) . . . . .	—	80,000

From this quantity of fish is produced:

Caviar from sturgeon. . . . .	—	600
» " all sorts of fish . . . . .	—	10,000

The whole of the fish is salted.

## 3. Caspian-Ural fishery.

White sturgeon (ac. huso); common sturgeon (ac. güldenstaedtii); shipa (schypa); stellated sturgeon (ac. stellatus) . . . . .	—	300,000
Belorybitsa (luciotrutta leucychthys) . . . . .	—	15,000

	Pieces.	Pounds.
Silurus ( <i>silurus glanis</i> ) . . . . .	—	100,000
Sandre ( <i>lucioperca sandra</i> , <i>lusmarina</i> ) carp ( <i>cyprinus carpio</i> ) . . . . .	—	2,400,000
Zherekha ( <i>aspis rapax</i> ); bream ( <i>abramis brama</i> ) . . . . .	—	500,000
Different small fish . . . . .	—	1,500,000
From this quantity of fish is produced:		
Caviar from sturgeon . . . . .	—	18,000
»    » all other sorts of fish . . . . .	—	3,000
Balyk (backs of dried fish) . . . . .	—	1,500
Glue . . . . .	—	200
Viaziga . . . . .	—	200
Cod liver oil . . . . .	—	1,000
Salted fish about . . . . .	—	2,000,000
<b>4. Caspian-Koura fishery.</b>		
White sturgeon (ac. <i>huso</i> ) . . . . .	5,500	55,000
Common sturgeon (ac. <i>güldenstaedtii</i> ) shipa ( <i>schypa</i> ) . . . . .	700,000	425,000
Stellated sturgeon (ac. <i>stellatus</i> ) . . . . .	900,000	225,000
Salmon ( <i>salmo caspius</i> ) . . . . .	45,000	35,000
Shamai ( <i>alburnus chalcooides</i> ) . . . . .	500,000	12,500
Silurus ( <i>silurus glanis</i> ) . . . . .	400,000	400,000
Sandre ( <i>lucioperca sandra</i> ) . . . . .	2,500,000	375,000
Carp ( <i>cyprinus carpio</i> ) . . . . .	1,500,000	337,500
Khashama ( <i>aspis rapax</i> ) . . . . .	1,250,000	93,750
Bream ( <i>abramis brama</i> ) . . . . .	1,250,000	125,000
Koutouma ( <i>leuciscus frisii</i> ) . . . . .	250,000	21,875
Lamprey ( <i>petromyzon Wagneri</i> ) . . . . .	100,000	1,250
Different sorts of fish . . . . .	—	75,000
From this fish is produced:		
Caviar from sturgeon . . . . .	—	45,000
»    » all other sorts of fish . . . . .	—	10,000
Balyk (backs of dried fish) . . . . .	450,000	—
The rest of the fish is salted.		
<b>5. South-eastern parts of the Caspian.</b>		
Sea gives: different sturgeons . . . . .	—	50,000
Other sorts of fish . . . . .	—	50,000
From this quantity of fish about 3,000 pounds of caviar are produced.	—	100,000
Thus the Caspian Sea gives:		
Different sorts of sturgeon . . . . .	—	1,675,500
»    »    » salmon . . . . .	—	82,760
»    »    » herring . . . . .	—	7,500,000
»    »    » lamprey . . . . .	—	51,250
Remaining sorts of fish . . . . .	—	21,344,625
Total . . . . .	—	30,654,135

## AZOV SEA REGION.

## 1. Azov-Don fishery.

	Pieces.	Pounds.
White sturgeon (acipenser huso) . . . . .	200	2,000
Common sturgeon (ac. güldenstaedtii) . . . . .	5,000	3,750
Stellated sturgeon (ac. stellatus) . . . . .	40,000	18,000
Shipa (ac. schypa) . . . . .	150	600
Sterlet (ac. ruthenus) . . . . .	25,000	1,200
Silurus (silurus glanis) . . . . .	40,000	40,000
Carp (cyprinus carpio) . . . . .	250,000	25,000
Sandre (lucioperca sandra) . . . . .	3,200,000	320,000
Bream (abramis brama) . . . . .	7,000,000	350,000
Taran (leuciscus rutilus); singa (abramis ballerus) . . . . .	500,000	10,000
Razor fish (pelecus cultratus) . . . . .	1,500,000	270,000
Belizna, vyrezoub, rybets (ab. vimba) . . . . .	160,000	15,300
Koutoum (leuciscus frisii) . . . . .	100,000	3,000
Herring (clupea 3 sp.) . . . . .	400,000,000	250,000
Pike (esox lucius) . . . . .	100,000	6,250
Laskir (blicca björkna) . . . . .	1,000,000	4,000
Different small fish . . . . .	4,000,000	6,000
	—	1,325,100
Caviar produced from the sturgeon . . . . .	—	2,000
»      »      » all other fish . . . . .	—	10,000

## 2. Azov-Kouban fishery.

White sturgeon (acipenser huso) . . . . .	500	5,000
Common sturgeon (ac. güldenstaedtii), shipa (ac. schypa), stellated sturgeon (ac. stellatus) . . . . .	120,000	60,000
Sandre (lucioperca sandra) . . . . .	4,000,000	400,000
Carp (cyprinus carpio) . . . . .	500,000	50,000
Taran (leuciscus rutilus) . . . . .	5,000,000	125,000
Bream (abramis brama) . . . . .	3,000,000	150,000
Rybets (abramis vimba) . . . . .	700,000	17,500
Razor fish (pelecus cultratus) . . . . .	500,000	12,500
Different small fish . . . . .	6,000,000	25,000
Shamai (alburnus chalcooides) . . . . .	500,000	7,500
Herring (clupea pontica) . . . . .	1,000,000	12,000
Silurus (silurus glanis) . . . . .	14,000	14,000
Barbel, crucian, tench and others . . . . .	1,000,000	25,000
Kefal (Mugil, 4 sp.) . . . . .	150,000	4,000
	—	902,500

## 3. Azov Sea fishery.

Sturgeon varieties . . . . .	—	150,000
Herrings . . . . .	—	40,000
Sandre, carps and all other small fish . . . . .	—	3,000,000
Mackerels, kefali, bychki and other sea fish . . . . .	—	20,000
	—	3,210,000

	Pounds.
Thus the Azov basin gives:	
Sturgeon sorts . . . . .	240,550
Herrings . . . . .	302,000
Small river fish . . . . .	4,876,050
Sea fish. . . . .	24,000
	5,442,600
From this fish is produced:	
Caviar from sturgeon. . . . .	10,000
» » small fish . . . . .	10,000
» » kefali . . . . .	500
Glue . . . . .	100
Viaziga (dried spine of sturgeon) . . . . .	100
Salted fish . . . . .	1,800,000
<b>BLACK SEA REGION.</b>	
<b>1. Crimea-Caucasus fishery.</b>	
White sturgeon (acipenser huso). . . . .	40,000
Kefal (mugil); scomber (scomber); prill (rhombus); soultanka (mullus barabitus); pelamida (pelamus sarda) and others. . . . .	500,000
Khamsa (engraulis encrasicholus) . . . . .	1,000,000
<b>2. North-western, Dnieper-Dniester fishery.</b>	
White sturgeon (ac. huso); common sturgeon (acipens. güttenstaedtii); shipa (schypa) and stellated sturgeon (ac. stellatus) . . . . .	100,000
Scomber (scomber) . . . . .	40,000
Kefal (mugil, 4 sp.) . . . . .	25,000
Other sea and river fish . . . . .	1,000,000
<b>3. Danube, Vilkovsk fishery.</b>	
Sturgeons, especially white (acipenser huso) . . . . .	32,000
Different small fish . . . . .	32,000
Herrings . . . . .	5,000
	69,000
Thus the Black Sea region gives:	
Sturgeons. . . . .	172,000
Other sorts . . . . .	2,603,000
	2,775,000
Amongst the latter, sea fish form about 1,600,000 pounds, or 60 per cent.	
From this whole quantity of fish is prepared:	
Caviar from sturgeon. . . . .	3,000
» » kefal . . . . .	3,000
Preserved fish in tin cans . . . . .	7,500
Salted, smoked and dried fish. . . . .	500,000
The remaining quantity is used in its fresh state, and is partly used for making oil and manure.	
<b>BALTIC REGION.</b>	
<b>1. Fishery of the Baltic border with the rivers Vistula, Neman and Western Dvina, such parts of the two first rivers as flow in Russia.</b>	

	Pieces.	Pounds.
German sturgeon (ac. <i>sturio</i> ) . . . . .	2,000	5,000
Salmon ( <i>salmo</i> <i>salar</i> ) . . . . .	3,000	1,500
Pilchard ( <i>clupea sprattus</i> ) . . . . .	500,000,000	500,000
Sprat ( <i>clupea harengus</i> ) . . . . .	—	200,000
Different sea and river fish, cod, prill . . . . .	—	100,000
	—	806,500
<b>2. Finnish fishery, in the governments of Esthonia and St. Petersburg, sturgeon (ac. <i>sturio</i>) . . . . .</b>	—	100
Salmon ( <i>salmo</i> <i>salar</i> ) . . . . .	10,000	5,000
Taimen ( <i>trutta</i> ), sig ( <i>coregonus</i> ) . . . . .	200,000	5,000
Spurling ( <i>osmerus eperlanus</i> ) . . . . .	—	20,000
Sprat ( <i>clupea harengus</i> ) . . . . .	—	100,000
All other sorts of fish . . . . .	—	300,000
	—	430,100
<b>3. Finland fishery, in the waters of the Baltic washing Finland, Salmon (<i>salmo</i> <i>salar</i>) . . . . .</b>	—	17,000
Sig ( <i>coregonus lavaretus</i> ) . . . . .	—	2,000
Spurling ( <i>osmerus eperlanus</i> ) . . . . .	—	10,000
Sprat ( <i>clupea harengus</i> ) . . . . .	—	600,000
Pilchard ( <i>clupea sprattus</i> ) . . . . .	—	40,000
All other fish . . . . .	—	100,000
Thus the Baltic region gives:	—	769,000
Sturgeon sorts . . . . .		5,100
Salmon " . . . . .		60,500
Herring " . . . . .		1,440,000
All other sorts . . . . .		500,000
	Total . . . . .	2,005,600
From this quantity of fish is prepared:		
Caviar from sturgeon . . . . .		250
" " salmon . . . . .		500
Preserves in tin cans . . . . .		200,000
The remaining quantity is salted or used in its fresh state.		
<b>REGION OF THE FROZEN AND WHITE SEAS.</b>		
Salmon ( <i>salmo trutta</i> ) . . . . .		70,000
Trout, sig ( <i>coregonus</i> ) spurling ( <i>osmerus eperlanus</i> ) . . . . .		50,000
Cod, peak and dorse ( <i>gadus</i> ) . . . . .		650,000
Herring ( <i>clupea harengus</i> ) . . . . .		100,000
Turbot ( <i>hyppoglossus</i> ) . . . . .		150,000
Wolf-fish ( <i>anarrhichias lupus</i> ) shark and others . . . . .		200,000
Thus the basins of the Frozen and White seas produce fish:		1,220,000
Salmon species . . . . .		120,000
Herring . . . . .		100,000
Cod . . . . .		650,000

Nearly all this quantity is salted, except the greater part of the herring and a small number of the salmon varieties, such as the spurling, and some other fish, all of which are used fresh or frozen.

The most valuable products of that region are the cod liver oil and semga (smoked salmon).

#### REGION OF THE RIVER AND LAKE FISHERIES.

Fishing also exists in rivers and lakes not included in the above mentioned regions. As these lakes and rivers occupy extensive areas and have very extended borders; they produce large quantities of fish. Nevertheless they have no great trade importance as the fish is principally consumed by the population of the neighbouring towns and villages, and only the produce of such large lakes, as the Finnish, the Ladoga, Onega, White, Ilmen, Peipuss and others, is consumed by the markets of St. Petersburg, Moscow and Warsaw. As there are no statistics showing the quantity of fish produced by these lakes the only method of attaining this, is to determine the quantity caught on a certain unit of area. Long investigations on numerous lakes of different governments have shown, that from 2 to 3 pouds of fish per dessiatine are taken at a haul; therefore, it may be considered that the average quantity is 2 pouds per dessiatine, or 179·25 pouds per square kilometre.

According to this calculation the productiveness of the lakes of European Russia is as follows:

	Pouds.
1. The lakes of the government of Archangel. . . . .	2,830,595
»    »    »    »    » Vologda. . . . .	108,626
»    »    »    »    » Olonets . . . . .	3,713,132
»    »    »    »    » St. Petersburg. . . . .	1,640,087
»    »    »    »    » Novgorod * . . . . .	680,531
Total in the northern governments. . . . .	8,972,971
2. The lakes of Finland . . . . .	7,467,429
3.    »    »    the government of Pskov. . . . .	178,439
»    »    »    »    » Estonia . . . . .	990,177
»    »    »    »    » Lithuania . . . . .	266,186
»    »    »    »    » Courland . . . . .	44,812
»    »    »    »    » Kovno . . . . .	81,021
»    »    »    »    » Vitebsk . . . . .	213,621
»    »    »    »    » Vilno . . . . .	111,314
»    »    »    »    » Grodno . . . . .	16,135
»    »    »    »    » Minsk. . . . .	34,039
»    »    »    »    » Poland . . . . .	65,505
The total of the Baltic and Western governments. . .	2,001,249
4. The lakes of the government of Tver . . . . .	108,625
»    »    »    »    » Yaroslav . . . . .	12,797
»    »    »    »    » Vladimir . . . . .	20,363
Total. . . . .	141,785
5. The lakes of the government of Perm. . . . .	329,193
»    »    »    »    » Orenburg . . . . .	260,862
Total. . . . .	590,055
The grand total of the lakes of the mentioned governments. . .	19,173,500

\* According to more detailed calculations the productiveness of the Novgorod lakes amounts to 867,000 pouds.

Besides, in all these governments there are numerous small lakes, not taken into consideration, as their areas are as yet not calculated; furthermore, there are a few lakes in other governments and finally the middle and upper currents of such rivers as the Volga with Oka and Kama, Don, Dnieper, Bug, Dniester, Neman, Western Dvina, Velikaia, Volkov, Northern Dvina, Pechora, and a large number of small rivers and streams, the total length and area of which, as well as the quantity of fish caught in them, are not defined. But without doubt the productiveness of all these rivers and lakes amounts to 6,000,000 pouds, as the middle part of the Volga, from Kamyshin to Nizhni-Novgorod, produces alone more than 1,000,000 pouds.

According to approximate calculations founded on investigations made in different localities the 19,000,000 pouds of lake fish are divided as follows:

	Pounds.
Salmon varieties, principally smelt . . . . .	2,500,000
Perch      "      perch . . . . .	10,000,000
Carp      "      dace . . . . .	7,000,000
bleak, roach . . . . .	

The 6,000,000 river fish, as follows:

Perch sorts . . . . .	2,480,000 pouds.	Sturgeon sorts . . . . .	500,000 pouds.
Carp      "      Salmon      "      "	3,000,000	20,000	"

Summing up all these totals it will be found that the fishery of European Russia amounts to 68,000,000 pouds.

By dividing European Russia into 4 sections at the 55° parallel and 40° east longitude from Greenwich, the following table, showing the productiveness of the Russian waters, is obtained.

25,172,277 pouds.

40°		55°		55°	
	Pounds.		Pounds.		Pounds.
Salmon sorts . . . . .	140,500	Salmon sorts . . . . .	40,000		
Herring      "      . . . . .	1,540,000	All other " . . . . .	50,000		
Cod      "      . . . . .	670,000			90,000	
Flat fish      "      . . . . .	155,000				
Sturgeon      "      . . . . .	5,100				
All other sorts . . . . .	625,000				
	3,135,600				
Lake fish:					
Salmon sorts . . . . .	2,160,000	Salmon sorts . . . . .	360,000		
All other " . . . . .	14,767,677	All other sorts . . . . .	1,659,000		
	16,927,677				
River fish . . . . .	1,500,000				
	Total . . . . .	21,563,277			
55°					35,763,135 pounds.
Herring sorts . . . . .	302,000	Salmon sorts . . . . .	82,760		
Sturgeon      "      . . . . .	412,550	Sturgeon      "      . . . . .	1,675,500		
All other sorts:		Herring      "      . . . . .	7,500,000		
Sea fish . . . . .	1,624,000	All other sorts . . . . .	21,395,875		
River fish . . . . .	5,879,050			30,654,135	
	8,217,600				
Lake fish . . . . .	227,000				
River " . . . . .	1,500,000	River fish . . . . .	1,500,000		
	Total . . . . .	9,944,600			32,154,135
	40°				
		42,098,735 pounds.			

As localities producing fish are generally very far from the places of consumption, and as the greatest number of fish are caught only at a certain times, methods for preserving them are quite indispensable. The principal of these is curing by salting, for which purpose more than 10,000,000 pouds of salt are yearly used, 7 millions of which serve for salting the produce of the Astrakhan fishery. In winter the cold preserves them, and therefore they are transported in a frozen state, not only over all Russia, but also abroad. Besides, fish are often dried in the air, as for example, cod on the Mourman, vobla in Astrakhan, and shemai on the Koura, Terek and Kouban; by this method are also prepared valuable b a l y k from the backs of sturgeons, shipa, belorybitsa (luciotrutta leucichthys). Furthermore, on the lakes of northern European Russia, smelts, iersh, bleaks and small perches, are dried in ovens.

The most valuable of these preserves is the caviar of the sturgeon. Immediately after the eggs have been removed they are rubbed through a sieve, slightly salted, put into tin jars, and are then ready for sale. When thus prepared the caviar is called fresh or zernistaia, and is rather dear. Another sort of this product, called p a y u s n a i a, is cheaper; it is cured in salted water and then pressed in bags.

During the last 10 or 12 years the production of fish preserves in tin cans has greatly developed in Russia. They are prepared in oil, jellies, wine and different spiced sauces, principally in tomatoes, and cost from 12 to 20 roubles per poud. At the present time there are more than 30 preserving factories in the Empire, situated in St. Petersburg, Reval, Riga, Odessa, Balaklava, Kerch and Astrakhan; the total output of all these factories amounts to 1,000,000 roubles annually. Nearly the whole quantity of fish caught in Russia is consumed at home, a very insignificant part of it being exported.

From 1888 to 1891 the export in pouds was as follows:

	1888.	1889.	1890.	1891.
Caviar . . . . .	207,438	215,052	171,187	208,865
" from sturgeon . . . . .	23,356	27,793	28,905	29,699
Fresh fish . . . . .	130,614	142,854	150,569	177,787
Pickled fish. . . . .	333	1,710	93	322
Salted and smoked . . . . .	337,219	372,069	354,160	545,358
Salted herrings . . . . .	—	20,035	27,890	27,859
Cod liver oil . . . . .	1,693	2,855	3,277	1,210
Fish glue. . . . .	4,478	8,450	7,008	7,598

The import during the same years was in pouds as follows:

	1888.	1889.	1890.	1891.
Fish pickled . . . . .	68,530	57,959	70,271	75,188
" salted, except herring. . . . .	396,367	3,340	372,412	446,998
Herrings smoked . . . . .	597	1,454	2,119	
" salted. . . . .	4,618,564	6,008,911	5,432,252	4,691,658
Cod . . . . .	947	827	92	
All other dried fish . . . . .	947	175	4,100	
Fish brought from the government of Archangel *. . . . .	981,210	854,182	961,887	823,394
Herrings brought on vessels from the government of Archangel . . . . .	11,644	24,379	31,136	—
Oysters . . . . .	6,352	6,865	8,522	6,915
Fresh fish . . . . .	—	—	—	256,297

\* This fish is imported duty free and is exchanged for flour, which the inhabitants of Archangel export on their own vessels.

## SEA ANIMALS.

The sea-animal trade in Russia might be very considerable. In the Arctic ocean there are seven species of whales (*megaptera boops* Fabr.; *balaenoptera rostrata* Fabr.; *b. borealis* lesson; *b. grimmii* goeb.; *b. Andrejevi* goeb.; *b. musculus* campano; *b. Sibboldii* Gray); several dolphins (*phocaena communis* less.; *arca gladiator lacapede*; *delphinapterus leucas* Pall, and *monodon monoceros* l.); five sorts of seals (*phoca annelata*; *phoca vitulina*; *phoca barbata*; *phoca Groenlandica* and *cystophora cristata*); and a very valuable morse (*trichechus rosmarus*). In the Eastern Ocean, besides several sorts of whales, there are the Kamchatka beaver (*enhyntris stelleri*) and the sea bear (*otaria ursina*); in the Baltic sea and Ladoga lake, the seal *phoca vitulina*; in the Caspian Sea, *phoca caspia* and in the Black Sea, 3 sorts of dolphins (*phocaena communis*, *tursiops tursio* and *delphinus delphis* and perhaps also, *tursiops parvimanus* lütken). But unfortunately not all of the above mentioned animals serve as objects of a well-organized and constant industry. Only the different sorts of seal form an exception, and as may be seen from the following data, they are yearly killed in considerable quantities.

Thus on the White Sea and the Northern Ocean from 40,000 to 80,000 seals are killed by Russian hunters per year; but it is impossible to define the number, as there are no registers concerning the seal trade. On Lake Ladoga and the Baltic Sea, the number of seals killed amounts to 1,000 and 1,500 a year.

In the Caspian Sea, about 100,000; thus in:

1886	were killed	78,895	seals
1887	"	119,573	"
1888	"	166,844	"
1889	"	95,683	"
1890	"	77,886	"

The seal (sea bear) (*otaria ursina*) forms on the Commander Islands an object of a regularly organized trade, practised by a licensed Company. During the last nine years the number of seals killed is as follows:

1884 . . . . .	52,652	seals
1885 . . . . .	41,737	"
1886 . . . . .	54,591	"
1887 . . . . .	46,364	"
1888 . . . . .	47,362	"
1889 . . . . .	52,868	"
1890 . . . . .	56,833	"
1891 . . . . .	30,689	"
1892 . . . . .	31,315	"

Total. . . 414,411 seals.

During the preceding nine years, from 1875 to 1883, the total amounted to 324,201 seals.

As has been already mentioned there is no information concerning the other sea animals. There is no doubt, however, that they are killed in considerable quantities, principally by the different tribes of Siberia and of the far north of European Russia, for whom the trade in sea and land animals forms the only source of existence.

## OTHER WATER ANIMALS.

Among the invertebrates, existing in Russia, only very few are caught, and they in small numbers, so much the more that peasants seldom use for food other water animals than fish proper.

The rich fauna of the Arctic Ocean does not produce any invertebrates, having a trade importance, except the common worm (*arenicola piscatorum*), which serves sometimes instead of the small fish moiva (*mallotus arcticus*) and peschanka (*ammodytes lanceolatus*) for catching fish of prey, such as, cod, prills and the like. These worms are dug out of the sand. In the Eastern Ocean trepangs (*holothurians*) and crabs are caught for export to China; the former are either caught with the aid of special forks or by drags, and after being boiled and dried are ready for sale; the latter are caught by draw-nets, sometimes a verst long. Here also the trade in sea weeds (*laminaria sacharinum*) is much developed; this hydrophyte is procured from the bottom of the ocean with the aid of long forks, and dried for sale; about 500,000 pounds of it are yearly exported to China. In the Black Sea, oysters (*ostrea edulis*, var. *adriatica*), and mytilus are caught by drags. Mytilus are used on the spot either raw or boiled with rice, and oysters, packed up in damp moss or seaweed, are transported to the principal markets. Small sea shrimps, of the species of *palaemons*, are consumed at home in great quantities.

Among river invertebrates the principal is the common crawfish (*astacus*) much spread in European Russia, and of which there are several species. In localities where crawfish are abundant, they are caught with special nets; when transported alive they are put in baskets filled with damp moss or nettles. In Aleshki, the lower Dnieper, the tails of crawfish are boiled and then dried; and on the Volga, in Volsk, government of Saratov, special crawfish are preserved in tin cans. However, this trade is very little developed, as well as the export of live crawfish to Germany from Finland and the western governments, rich in lakes.

The production of river pearls (*margaritana margaritifera*), so much developed in former years, has much decreased latterly. Nevertheless, till now much pearl is being procured from rivers, which fall into the White Sea and the Arctic Ocean. It is generally caught with the hand, sometimes with a net.

Besides the above mentioned, the leeches (*hirudo officinalis*) and the river sponge (*spongilla*) are the only water invertebrates of Russia, which have a trade importance. Leeches are principally caught in Transcaucasia, and that in very small quantities, as they are seldom used now by medical men.

## DIFFERENT METHODS OF FISHING.

It is of course very difficult to describe or even give any adequate idea, in such a short sketch as the present, of the different methods and implements used for catching fish, as has been already mentioned. Nevertheless, an effort will be made to explain the more important of these different methods.

All the fishing implements may be divided into groups, either as to the material of which they are made, or according to the manner of their use. But in the present sketch, which treats principally of implements used by Russians in European Russia, without including those of foreign invention, they are divided in quite another way.

Nets, as well as other fishing apparatus, are either made on the spot by the fishermen themselves, or by peasants of the neighbouring villages. Thus for example, hooks and nets for the Caspian-Volga fisheries are mainly brought from the Nizhni-Novgorod government, where the making of nets by peasants is centralized in the districts of Nizhni-Novgorod, Kniaginin and to some extent, in that of Balakhna. The north-west of Russia is provided with nets made by the peasants of the districts of Ostashkov, Demiansk and Valdai, government of Novgorod. The net industry exists, however, also in the governments of Poltava, Riazan, Orel and Moscow. The making of nets in factories is very little developed; there are only two net factories, both on the borders of the Azov Sea, one in the town of Eisk and the other in Taganrog. During late years a factory for the production of nets from cotton yarn is being organized in Reval and will be quite a novelty in the industries of Russia. Generally fish nets are made of hemp or flax yarn; the fine threads are twisted and produce, for the plaiting of nets, cord of different thickness, called by the number of its threads *dvoinik* (two threads), *troinik* (three threads), and the like. In the Caucasus, nets for shemais are made of raw silk; and on the Aral, of a local plant, *tourka* or *kendyr* (*apocynum*).

The meshes of the nets, serving for one purpose or another, are of different sizes, and accordingly they bear different names; thus, for example, a net through each mesh of which one finger can pass, is called *slepoushka*; two fingers, *dvoopershnik* or *chastik*; three fingers, *mezheoumok*, and so on. In order to make the nets stronger and more durable they are either steeped in a decoction of barks of different trees, such as the willow, alder, and sometimes larch, or they are pitched, or boiled in oil and then dried, as in the western governments, or finally, smoked, as in the north of Russia. These methods for preserving the nets do not, however, hinder them from being rapidly destroyed, especially so in the Caspian and Black seas, by what is called the «net plague», the cause of which is until now unknown.

All fishing nets can be divided into: hand nets, mobile nets and immobile nets. To hand nets belong all those that are fixed to hoops, such as bag nets, and the like; also cast nets, called at the south of the Caspian Sea, *malouska*. These latter are round and have leaden weights fixed on their peripheries; when well thrown, this net lies flat on the surface, and then little by little its sides meet and the net acquires the shape of a purse. All such nets are of no great importance but nevertheless, when fish are abundant, they catch great quantities of them. In the Arctic region exists a special square, cast-net, called *not* or *poddon*; it is always thrown from four boats, which are stationed at its corners; it serves for catching *saida*, a special sort of cod (*gadus virens*).

Immobil e nets are sometimes quite simple, sometimes fixed on hoops and sometimes of a very complicated construction. Simple immobile nets are of different dimensions, and have meshes of different sizes and construction, according to the locality, where and when used and what kind of fish is to be taken. Sometimes two or three nets, having various meshes, are cast at the same time. There are summer and winter nets; of the latter the most important is the so-called *akhán*, used in the north-eastern parts of the Caspian Sea for catching white fish and sturgeons. In the various parts of Russia these immobile nets bear different names, dependent on the fish they are intended to catch; thus, they are called *stavoushki*, *zaveski*, *garvy*, *botalnitsi* et cetera.

These nets, stretched on a row of hoops, which gradually decrease in diameter, form a conical apparatus, which is called in the south, *venter*, and in the north,

merezh or matka. Into the first hoop a net funnel, having an opening at both ends, is introduced; sometimes two or three of them are fixed one after the other. In order that the fish should enter the venter, either at the beginning of it a large funnel is placed, or at the sides nets called wings are stretched out, or finally one net is introduced into the middle of the implement. These venters are sometimes of gigantic size, being  $3\frac{1}{2}$  sagenes high and 12 sagenes long, as for example on Lake Ladoga. The most interesting method is the placing of the venters in rows, joined by their wings, so that the fish, whichever way they go, should knock against the net and so become led into the venter. Thus on the north-western lakes special traps or snares, made of nets, are placed for fish. Similar ingeniously invented traps are used in the south where, as for example in the Ural, they are so arranged, that the fish entering the trap must needs touch a string to which a bell is fixed, and thus by ringing it, lets the fishermen know that it is caught. Very complicated and ingenious traps are used on the Black Sea for catching mackerel and scomrels; they consist of square nets fixed on piles; one side of the net is in the water and when the fish gets into it, this side instantly rises.

To mobile nets belong floating, and draw nets. The first, bearing various names, such as svinchatka, rezhaka, poplavnia et cetera, are made in different ways. Sometimes they float themselves along the river, and sometimes drawn by fishermen in boats; dependent upon where the fish are swimming, the nets either float on the surface or are let down into the water more or less deep; this is attained either by putting weights to the bottom of the net or by augmenting the cork floats on the upper strings. Floating nets have from two to three sides; of these the principal are bag nets, drawn by boats, and called in the Ural yaryga, and on the Volga, poiedoukha, boulgaka.

The draw net, nevod, is the principal fishing apparatus. It is of different lengths, sometimes a verst and more, and has in its middle a bag, into which the entrapped fish assemble. The side parts of the nevod are called wings, of which the principal are, the wing turned towards the shore, and which is upheld by a rope wound around a post; and another one, turned towards the middle of the river. The first is called piatnoe or beregovoe, and the second, bezhnoe or strezhnevoe. The nevod is cast in the following manner: it is let out little by little from a boat, leaving the shore, on which stands a man, directing the rope pole; the boat goes a little down stream, then curves out and returns to the same shore; thus the nevod makes a bow, and is drawn to the shore by both wings. In the same way fish are caught under ice; in such a case the nevod is let into the water through special ice holes and then drawn out on the ice. In some localities, as for example on the Caspian Sea, the nevods are stretched out in boats, this same method is also practised in the north-western lakes, and on the White Sea, where sometimes two and even four nevods and boats are used at the same time. Here also a net, called kerrevod, is used; it consists of a bag, called matnia and only one wing; such a nevod is cast from one boat.

The size of the meshes and the construction of the nevods are very different; in every nevod, however, the smallest meshes are in the centre bag, augmenting gradually the further they are from the centre, and are the largest on the nets forming the wings. Especially small meshes have such nets as serve for catching small lake fish; very often they are even not knitted, but woven.

In order to frighten the fish and make them go into the trap, bits of bast are tied to the net, which trouble the water and for this reason this net is called moutnik,

troubler. As sea fishing is very little developed in Russia the using of the so-called bag-net (*koshelkovi*) is almost unknown here, though several years ago, such nevods were tried for catching *moiva*. Besides large nevods, everywhere small ones are used; some of them having no bag in the middle; such small nevods are not cast from boats but straight from the shore, and are called *brendi* or *brodni*.

#### WOODEN FISHING IMPLEMENTS.

Notwithstanding the abundance of forests in Russia there are very few fishing implements made of wood; such are *vanda*, *morda* and *nereda*. The first is plaited from willow twigs, and the second is made from small, thin sticks. All these implements are made according to the type of the *venter*, that is, they consist of two cones, of which the smaller is put into the longer, and has at its latter end an opening, through which the fish enter; in the *vanda* or *vanta* the interior cone comes out from the exterior as in the telescope funnel. The *nereds* on the Volga, and the *viunnitsa* in the north, serve exclusively for catching lampreys. In the far north of Russia a special implement is used; it is made of wooden planks, having the lower opening and part of the upper one covered with a net. All these devices are used in various ways; very often they are set at the end of a picket-dam, or weir, made of wooden poles, and sometimes of cane interlaced with ropes. These river fences are placed in such a manner, that they form small yards of special form and have a narrow issue through which the fish enter. Sometimes the fish are taken out from such traps with small nets; similar weirs are called in the south, *kot*.

Sometimes weirs, made of twigs or thin piles, are laid all along the river, having different fishing devices introduced between the piles. Such picket-dams, called *zakol*, are principally used in the north for catching salmon. In general the Russian laws prohibit such a fencing of the whole river; however, it is practiced everywhere, as it is very difficult to investigate and see if the river is fenced, especially on the Volga, where the weirs are made of nets, called *zapor*. When such devices are constructed for several years they are partly made of metal; such were: a weir on the Koura, which according to the new laws of 1880 had to be taken down; and one existing till now on the Ural, near Uralsk, and which keeps the fish back in autumn. There is quite a special way of catching the *kefalli* in the Crimea, with the aid of matting nets, or of those made of cane. Such nets, made in the form of long, narrow and shallow boxes, are set during the night in long semicircular rows on the sea surface; then the *kefalli* are frightened into them by boats coming down towards the nets. Seeing the dark end of the mat and taking it for a weir, the *kefal*, a very timid fish, tries to jump over it and falls into the net, sometimes in such quantity that the net sinks. The driving of fish into nets or weirs by noise, such as with the splashing of oars or with devices specially made for the purpose, is practised nearly everywhere; this method of catching fish is called *gromki* or *plavnia*.

#### FISH HOOKS.

The principal locality for making hooks, is the village Bezdvodnoe and its neighbourhood, in the district of Nizhni-Novgorod. There are different fishing devices with hooks in Russia, of which the principal are: the small fishing tackle, with line and one,

two or even more hooks; this device has a trade importance, only for catching dorse on the White Sea; then comes a whole row of small implements, consisting of ropes of different length, with hooks on them; of such are the *poddlednik*, *somovnik* and *podpousk* on the Volga. But of all these the principal are the *peremet*, *podolnik* and *yarous*, which serve for catching cod on the Mourman, maselg and other fish. These implements consist of a whole row of hooks on small lines, all of which are fixed to one general line; which, being sometimes several versts long, is fastened on the river, lake or sea, either to small anchors or piles, and is used in winter, as well as in summer. The hooks are of different size, according to the fish to be caught, and are generally made of iron; only in the north brass hooks are used, and that very seldom. Sometimes small fish, serving as bait, are put on the hooks; but very often no bait is used at all, as for example for catching the sturgeon sorts, although on the Caspian Sea when white sturgeon is caught, the *vobla* serves as bait. On the Volga a special implement, called *shashkovaia snast*, is used for catching the sterlet; it has the hooks standing downwards. The sterlet is also caught with common fishing rods, and with earth worms as bait.

For catching game fish with the rod, instead of bait, coloured rags, leaden fish and even small bells are used, as for example of the Choudsk Lake for catching eels. In the south, salmons are attracted by a noise resembling the croaking of a frog; this noise is produced by striking the water with a special instrument, and the hook, used for that purpose has a live frog fixed to it. A very ingenious implement is used on the Volga for fishing white fish (*belorybitsa*); it is called *sidebka* and is so constructed, that the fish caught is instantly thrown out on the ice..

Besides implements consisting of hooks attached to a line, there are such as have the hook on a metal spear-head, fixed to a wooden handle such are different gaffs and fish spears. With these, fish are caught also in the night time; the fishermen then sit in a boat and have a fire burning at the prow; these gaffs are of different lengths. The fishing with the aid of these spears is especially interesting on the Ural, where in autumn the fishermen know, by counting the number of splashings of the fish during a unit of time, in what place and how many fish have hidden for the winter; later on, when the river is frozen the fishermen break through the ice, and with spears, which are sometimes nine sagenes long, catch valuable fish of the sturgeon sorts.

To the implements just described belong also different harpoons, used for killing all sorts of sea animals; sea bears or seals are slain with heavy sticks, which sometimes have at their ends metallic spears; these sticks are called on the Commander Islands *drygalka*, and on the Tiulen islands of the Caspian Sea, *kolotoushka* or *che-kousha*. Moreover, some animals are caught with floating, or simple nets, into which they are driven by men sitting in boats; in such a way seals on the Caspian Sea, and the white grampus at the mouth of the Pechora are caught; for the latter, there exist special nets.

Besides the above mentioned fishing apparatus there are many others, not described here, and not belonging to any of the above types; such are: apparatus for keeping alive the fish caught; boats and vessels used in fishing, for catching or transporting fish; pick-axes for breaking through the ice; long poles for stretching fishing implements under the ice, and many other instruments, devices and appliances used in this industry in Russia.

## CHAPTER XX.

**Rural Industries of the Caucasus.**

Characteristics of the country; population, climate, irrigation and rivers; agriculture; gardening; wine manufacture; apiculture; cattle breeding; importance of the Caucasus to Russia.

To the south-east of European Russia, on the wide Caspian isthmus uniting Europe with Asia, lie ten governments and provinces, which, under the general name of the Caucasus, constitute one of the most interesting tracts of the Russian Empire. Forming about 2·1 per cent (8,579·95 geographical square miles) of the whole areal extent of Russia, the Caucasus at the same time presents, in its superficial formation, natural characteristics, climate, productiveness and population, the most diversified region in the whole of the Russian territory. This variety in the natural characteristics of the country is to be explained by its geographical position, lying as it does in the latitude of southern Europe, and also by the fact that within its boundaries are included localities below the level of the sea, high cool hill plains, and lastly, lofty elevations, like Elbroos, covered with eternal snow, and rising to a height of 18,525 feet above the sea level.

The Caucasian chain, intersecting the whole Caucasian territory in a diagonal direction, from the north-west to the south-east, effectually divides it into two parts, Northern Caucasus and Transcaucasus, the latter lying on the farther side, to the south of the mountain chain. Northern Caucasus, which is bounded on the north by the Don and the Astrakhan provinces, forms almost throughout a continuation of the southern Russian steppe, a slightly undulating stretch, overlaid in the western half and central portion with an extremely fertile black-earth soil, richly clothed with a steppe grass vegetation, and admirably adapted to the agricultural and cattle-breeding industries. The eastern division of northern Caucasus is for the most part composed of clay and sand plains, which once formed the bed of a long dried up sea, enjoys a dryer climate than the western division, and is for this reason in parts unfitted for cultivation. Only in the southern province of northern Caucasus, near the Caucasian chain, is there any considerable ascent of soil, and there are hills, separate mountains and chains of mountains, which, rising higher and higher, form at last the Caucasian chain, that stretches like some giant wall from the Black Sea to the Caspian, for 1,420 versts, attaining its loftiest height in the centre and its lowest level at either end, and occupying a range of 2,600 geographical square miles.

The extent occupied by the Caucasian chain and its branches presents an endless variety of soils and climates, and consequently an equal variety in the conditions of

rural industry. In the deep vales and defiles are cultivated many different kinds of grain and other plants, the variety of which becomes the less marked the higher one ascends, till in the end is found only barley and rye, which in Daghestan grow at a height of 8,000 feet above the sea. The extensive mountain pasture lands, which lie within and above the forest zone, are well suited for cattle breeding, whilst, on the contrary, the considerable stretch of deep declivities and precipices, covered as they are with eternal snow, is altogether unfitted for cultivation or for breeding cattle. Its forests, after all, form the crowning beauty and charm of the Caucasian chain, and notwithstanding the excessive clearages that have been made, are still remarkable for their natural richness and variety. The Caucasian chain, like all Asiatic mountain chains, is difficult of access and is very poor in convenient or passable roads for the connection of its different slopes; the most remarkable being the Military Georgian Road, that runs from Vladikavkaz to Tiflis through the Dariyal defile.

The Caucasian chain is joined from the south, and almost in its central point, by the Suram chain, which, on the one side, connects the Caucasian mountains with the wide mountain region that extends over the greater part of Transcaucasus, and on the other side, divides the latter into two very characteristic and distinct tracts, the eastern and the western provinces. Eastern Transcaucasus includes in the north-east the valley of the Kura and its secondary tributaries, and in the south, on the borders of Persia, the low valley of the Araks. Western Transcaucasia embraces the basin of the Rion and other less important rivers, as well as the lowlands on the Chorokh. All the rest of Transcaucasus, between the valleys of the Kura, Araks, Rion, and Chorokh, forms an extensive hill plain, from 4,500 to 7,500 feet high, intersected by separate mountain ranges, and in general, constitutes the extreme north-western link of the upland chain, which stretches through the whole continent of Asia from the west to the east, and bears the common name of the Little Caucasus. The Transcaucasus is bordered by Turkey (Anatolia) and Persia, on whose Russian frontier rises the famous biblical mountain, Arrarat, to a height of 16,916 feet. Western Transcaucasia (the basin of the Rion and the lower parts of the Chorokh) is covered with a fine wood vegetation, which owing to the warm climate and the abundance of moisture, flourishes here with unwonted luxury. In Eastern Transcaucasus forests are met with only on the frontier of the Little Caucasus, where it descends into the valley of the river Kura, its hill plains being generally almost nude of forests, whilst the central and particularly the lower districts on the Kura have all the characteristics of a steppe. Only in the extreme south-east, on the borders of Persia and on the shores of the Caspian Sea, the eastern slopes of the Talysh mountains are covered with forests, which by their variety and vitality remind one of the dense forests in the basin of the Rion and the lowlands of the Chorokh.

In consequence of its peculiar relief and its, in general, warm climate, the Transcaucasus permits of the culture of a most varied vegetation, in grain, oil, cotton, dyeing, and other plants; whilst gardening and vintaging form important items of cultivation. On the other hand, the steppe regions in the eastern division of the Transcaucasus, where the hilly pasture lands are covered with the richest grass, furnish almost everything necessary to cattle breeding, which forms in many parts the principal source of livelihood and wealth.

The geographical position of the country, which lies between 38½ and 46½ degrees

north latitude, the variety in the altitude of its different parts, ranging from 85 feet to the height of perpetual snow, the division of its area by mountain chains into separate and almost closed-in provinces, the proximity of seas that are never frozen, and the hill plains and steppes of Asia, where the summers are hot; all this stipulates an equally great variety in the climatic conditions of the country. The climate of northern Caucasus resembles that of the southern Russian steppes, with this difference, that it is in general somewhat warmer, and in some parts in the west, as in the basin of the Kuban, moister; whilst in the east, along the Kuma and the Terek, the summers are drier and hotter. In the northern forelands and foothills of the Caucasian chain, with a slightly lower temperature, there are very heavy rains from May to July, which keep the lands well watered and are extremely favourable to agricultural operations. The climate of the mountain ridge plain is, of course, very varied; but one peculiarity, common to the whole of the Caucasus, is to be noticed, namely an increased dryness and summer heat in proportion as one advances from the west to the east. The snow line, which in the western division of the Caucasian chain falls to almost 9,500 feet, rises in its central point to 10,500 feet, and still further towards the east to 12,000 feet above the level of the sea. The Transcaucasus, which is sheltered from the north by the Caucasian mountains, is considerably warmer than Northern Caucasus; in the lowest parts, the mean temperature of the coldest month is some degrees above zero, frosts are rare, and never last long, and what little snow falls soon melts. The climate in the hilly parts of the Caucasus is much harsher, the frosts are severe, and the thermometer sometimes marks in Ardaghan — 35 degrees Celsius; an enormous quantity of snow falls, and the prevailing temperature even in summer is moderate. Summer heats are most felt in the eastern division of Transcaucasia, where during the bright cloudless summer months, even at a height of 2,000 to 3,000 feet, the thermometer rises to +40 degrees in the shade. With reference to the rainfall and to atmospheric moisture in general, the Suram chain divides the Transcaucasus into two distinct tracts. In western Transcaucasia there not only falls a sufficient quantity of rain, but in places so much, from 1½ to 2 metres, that the soil becomes soaked and needs to be drained, the heaviest falls being in the summer months. In eastern Transcaucasus, especially in the steppes and generally in low places, the rainfall, on the contrary, is so slight, from one-seventh to one-ninth of that in western Transcaucasia, that artificial irrigation is absolutely necessary, the more so as the rain falls principally in the autumn. In this respect, the eastern slopes of the Talieshinsk mountains, in the extreme south-eastern division, form the sole exception, and in these parts the rainfall is much lower than in western Transcaucasia. The hill plains of the Little Caucasus are in most cases well watered.

The artificial irrigation of the land is, therefore, in consequence of the climatic conditions of the country, of the very greatest importance for every kind of land culture in all the lower parts of eastern Transcaucasia. The two principal rivers of the country, the Kura and its tributary the Araks, together with their many secondary branches, as well as a number of rivulets and mountain rills, serve as feeders of the irrigating canals. From 50 to 55 cubic sogenes of water are poured per second into the basins of the Kura and the Araks during the irrigating months of the year, from March to October; of which quantity, 87·1 per cent is furnished by rivers and rivulets, 10·4 per cent by springs and marshes, and 1·5 per cent by subsoil water conveyed through subterranean canals. The extent of all the watered lands in eastern Transcaucasia amounts to above 1,000,000 dessiatines, which form scarcely a half of the extent that might be

watered, if only a newer and improved system of irrigation were employed. The wide stretches of waterless steppe plains, the Mugan, Milsk, and other steppes, might serve as an excellent field for works of this kind, the more so as in these places are still to be found the existing ruins of irrigating canals, from which it is known that in some earlier time a regular system of irrigation was practised on a large scale. The successful attempts already made to organize such a system as the Marie Canal, which waters the Karayaz steppe, near Tiflis, over a space of 12,000 dessiatines, justify one in hoping that before long all the lower parts of eastern Transcaucasus will be properly and regularly irrigated. The period of irrigation in the basin of the Kura commences in March, when the watering of gardens, kitchen gardens, clover and grain fields also begins. During the months of April vegetation of all kinds is watered; towards the end of May the grain crops are gathered in; but the watering of gardens, kitchen gardens, melon and water-melon beds, lucern, clover, sesame, (*sesamum indicum*) cotton shrubs, and castor beans, continues, the quantity of water used being reduced by one-half. In the beginning of September, irrigation ceases altogether, and only the winter crops of barley and wheat are watered in October. Barley and wheat are generally irrigated three times during the period of their growth; gardens, six times; vineyards, two or three times; and cotton shrubs, four or five times.

From an ethnographical point of view the population of the Caucasus presents no little interest and is extremely composite, but only a few of its different races, owing to the extent of the territory they occupy and their number, exercise any marked influence on the industries and development of the country. The northern Caucasus is for the most part inhabited by Russians, in some places principally by Cossacks; western Caucasus and a large portion of central Caucasus, by Georgians; central Caucasus, and especially its southern parts, by Armenians; the Daghestan province and the Caucasian chain, by Caucasian mountain tribes; and lastly, all the eastern division by Aderbeidzhan Tartars. The Russian contingent to the population of the Transcaucasus is mainly concentrated in the towns, and only here and there are found Russian colonies. In the adjoined table will be found the more important data concerning the extent, number, and density of population in the different government and provinces of the Caucasus:

Governments and Provinces.	Extent in geographical square miles.	Population.	Density of population in each geog. sq. mile.
Stavropol government . . . . .	1,100·22	672·35	611·0
Kuban province, with Black Sea district . . . . .	1,846·93	1,408·70	762·6
Tersk " . . . . .	1,261·28	755·30	598·8
Daghestan " . . . . .	540·40	590·35	1,092·4
Koutais government . . . . .	662·32	929·96	1,404·1
Tiflis government, with the . . . . .			
Zakatal district . . . . .	809·92	947·84	1,170·3
Elisavetpol government . . . . .	801·35	728·25	908·7
Baku " . . . . .	713·66	708·09	992·1
Eriwan " . . . . .	505·31	661·61	1,309·3
Kars province . . . . .	338·56	170·10	502·4
Total . . . . .	8,579·95	7,572·55	859·2

From the above table it may be seen that the Transcaucasus is, on the whole, more densely populated than Northern Caucasus, and that the population is most dense in the Koutais and Erivan governments. The province of Kars, the last to be united with Russia, is the least thickly populated. The parts of the country lying lowest, on an average up to 3,000 feet above the sea level, are inhabited by the large majority of the population; but none the less, there are not only large colonies, but whole cities, as for example Kars, occupying places more than double this height. The highest spot in the Caucasus, forming a place of constant habitation, appears to be the Kurush settlement, in Daghestan, which is 8,356 feet above the level of the sea.

The large majority of the population of the Caucasian country have settled homes and places of residence. The nomadic tribes are mostly to be found in the north-eastern division of Northern Caucasus and in some parts of the Transcaucasus. The south-eastern division of the Transcaucasus is inhabited by semi-nomads, who everywhere represent the different transitional stages from a state of nomadic existence towards a more settled mode of life.

The Caucasus is essentially an agricultural country. In the greater number of localities in the Caucasus, trade and commerce are till now but little developed; whilst agriculture forms the principal, and in many places the only source of livelihood. The wide plains and fertile spots lying at the foot of mountains in Northern Caucasus, with its frequent stretches of rich black-earth, as well as the greater portion of the Transcaucasus, with the varied composite soil which it owes to a mild climate and a sufficiency of rainfall, afford all the conditions that are necessary or favourable to the cultivation of nearly every kind of vegetation and food products. It is only in the lowlands of eastern Transcaucasus that recourse need be had to artificial irrigation; and for this reason, the organization and introduction of a well-considered system of irrigation into these parts is a matter of primary and urgent importance.

The cultivation of cereals forms in nearly every part of the Caucasus the principal branch of rural industry, notwithstanding that in many parts of the country climatic and other conditions are favourable to the cultivation of the most varied vegetation. But these cultures, of such importance in certain localities of the Transcaucasus, are scarcely at all practised in Northern Caucasus, where, with rare exceptions, grain growing occupies the first and principal place.

It must, therefore, be expected that one will find in the Caucasus, a country characterized by such varieties of climate, soil and economical conditions, an equally striking variety in the systems and modes employed in the cultivation of the land. And, in truth, one notices such differences, not only in the different tracts, provinces and governments of the country, but very often in one and the same locality, they depend mainly on the relative height of the place above the level of the sea.

In the steppe plains and places lying at the foot of mountains in Northern Caucasus, where there is an abundant rainfall and a comparatively sparse population the fallow system is up to the present day adopted, but in the woody forelands the forest system is still followed and practised. The three-crop system is less in use, and still more rarely the more advanced systems of cultivation is met with, these being restricted to the growth of tobacco and oil plants. The fields, by reason of their natural richness of soil, are very seldom manured.

In relation to the system and modes employed in the cultivation of land, as well as

in relation to climatic conditions, the Transcaucasus may be divided into two tracts, the western and the eastern. Abundance of forest land, the important bearing and wide extent of garden culture, the almost complete absence of pasturage in consequence of the quick growth of forests, and the considerable quantity of ploughed and cultivated land in the plots granted to freed peasants, these form the leading characteristics of western Transcaucasia. In the lowlands, which are watered by the overflow of rivers, and which consequently, to a certain extent, profit by the restitution of the nutritive substances that are extracted from the soil by the process of cultivation, one and the same plant, generally maize; is grown on the same field from year to year; sometimes, besides maize, other crops, such as wheat, are sown, a more or less regular system of alternation being observed in the sowings; but sown as they are on a very small portion of the entire arable land, they cannot be regarded as changing the general character of local land cultivation. Only the more contiguous and more accessible portions of the lowlands are manured, and then but seldom. When the land, by a long uninterrupted tillage, has become exhausted, it is allowed to lie fallow for a more or less extended period of time. In all other parts of western Transcaucasia, the most varied systems of agriculture are practised, and all the transition systems are met with, from the forest system, which at one time prevailed almost universally, to the one crop, three crop, and many-crop system, the latter with intervening sowings of fodder produce, such as maize, red darnel, *lolioium perenne* et cetera, and with or without the application of manure. The most generally adopted means of reviving the fertility of a temporarily exhausted soil is to let it lie fallow, and only in those cases where there is a sufficient abundance of cattle by fertilizing it with cow manure. In places where there is a scarcity of land there are two summer sowings on the same field; and after the barley or wheat crops are gathered in, maize is sown, which, however, from the height of the locality, frequently does not fully ripen, and therefore, can be used only as green fodder for cattle. Sometimes, after the spring barley has been harvested, maize is sown, and after that the winter crop of wheat, and when in the following year this crop has been gathered in, once more maize is sown, and in such cases, it generally ripens.

The systems and conditions of agriculture in eastern Transcaucasus differ very widely from those the western. The very trifling extent of forest land, the considerable percentage of arable land, and the equally insignificant percentage of garden plots in proportion to the whole quantity of land cultivated, and the greater or smaller quantity in all its districts of woodland, these form the characteristic traits of the eastern division of the Transcaucasus. In the lowlands, where the cultivation of the land is carried on only by the aid of artificial irrigation, the entire organization of land culture depends on the proportionate means of irrigation afforded by the nature of the locality. If there is an abundance of irrigating water during the whole period of vegetable growth, gardens, kitchen gardens, rice lands, and plots of the more valuable grains, such as cotton, sesame, and tobacco, are freely cultivated; but if a supply of irrigating water can be counted on only in the autumn and spring, the agriculturist is obliged to content himself with the culture of other grains, except rice, and then only on those lands where water can be obtained; and if, lastly, there is no supply of water whatever, the fields remain uncultivated. In places where there is sufficient water but little land, the portions of land that admit of being irrigated are sown immediately after the barley and wheat harvests, with melons, watermelons, and vegetables.

Rice forms the most characteristic produce of the region, after which follows the culture of the vegetable plants just mentioned, and lastly, in some places, that of fodder grasses, such as lucerne, clover and esparcet. If the means of irrigation are abundant, there are several sowings, sometimes on one and the same field for many years; the fertility of the soil being renewed either by irrigation, or the cultivation of perennial fodder grasses, or lastly, by manuring the field with dung or with the ashes left after it has been burned for fuelling purposes. In these same watered lands, but where there is a sufficient supply of water only in spring and autumn, the grain and fallow systems are applied in different ways, according to the quantity of available water; if the water at these seasons of the year proves sufficient, wheat is sown each year on one and the same plot of land, or only for a certain number of years, after which the land is allowed to lie fallow for a year or two. If, however, there is little water, a considerable portion of the field lies fallow for a longer period of time. In this way the extent of land cultivated depends on the quantity of available water, and the land is allowed to lie waste or fallow, not to renew the fertility of the soil, but simply because there is an insufficiency of moisture. Very nearly the same order and conditions of agriculture are observed in the fertile districts watered by overflows of the river Kura, such places being sown each year at the time of the yearly overflow; if however there is no overflow, they remain uncultivated, or are sown for pasturage or hay crops.

In those tracts of eastern Transcaucasia where the means of irrigation are insufficient, the systems of land cultivation are in most places multiform, the land being allowed to lie fallow, or given to pasturage, grain, and grass sowings. The fallow system is practised in many localities, where there is an overabundance of land, or where the soil conditions are unfavourable; it is, however, nearly everywhere now replaced by different forms of the grain system, and may be said to have outlived its day. The various forms of the grain system differ in the time given to the land to rest, which in most cases is less than in European Russia, and the number of years during which the sowings on the same field are continued without interruption. The forest system, in consequence of the small extent of forest land, is practised chiefly in the Bakou government, in the Lenkoran and Kuban districts, but very little elsewhere. The pasturage system is common in the hilly parts of the country where the cultivation of grain is still practicable, and where, by reason of the abundant rainfall, portions of land allowed to lie fallow are quickly covered with good grass. The grain system, which in most cases has replaced the fallow system and is therefore extensively adopted in eastern Transcaucasia, is practised in many and varied modes according to special local conditions, and consequently there is in use the one, two, three, and many-year grain rotation, with or without animal or earth manure, and with grass sowing or without it. In some of the Russian colonies, in the uplands of the Tiflis district, where the cultivation of grain is exposed to too great risks, the colonists do not occupy themselves with the growing of cereals, but convert the whole of their land into meadows. The crops of hay are generally good, and this, coupled with the certainty of being able to sell it, renders hay growing far the more profitable and expedient.

Passing on to a short review of technical agriculture, it must be at the outset remarked that, whilst the newest and most improved agricultural implements, ploughs, scythes, reaping hooks, thrashing machines, et cetera, are much used in the northern Caucasus, particularly in the Kuban province, they are but rarely to be found in Transcaucasia,

and there, almost exclusively in the shape of different ploughs, and on the farms of Russian colonists or German landowners, very seldom on the farms of natives. In the majority of cases, the tillage of the soil, the getting in of the crops, and the thrashing of grain, are carried out with the most primitive and cumbersome instruments. In tilling land the common peasantplough, *sokha*, is mostly used in the Transcaucasus, or the heavy Georgian plough, the latter being chiefly employed for upturning the soil and for deep tilling. This plough is excessively cumbersome and very dear, costing as much as seventy roubles, works very unsatisfactorily, and requires immense physical labour. To work such a plough it is necessary, according to the nature of the soil and other circumstances, to yoke from three to twelve oxen or buffaloes, and more often from eight to ten pairs. It is only Russian colonists who sometimes plough with horses.

From what has been just said, it will be evident that only a very few peasant farmers have the means of commanding a sufficient amount of animal labour, and the peasants, for the most part, are obliged to form associations or companies, the members of which arrange amongst themselves to supply cattle for ploughing. One of the members supplies a plough, another the animals, a third, who has no cattle, acts as ploughman, and so on. It sometimes happens that no one of the members is able to supply a complete plough, in which case one member furnishes the ploughhead, a second the ploughshare, a third the wooden part, a fourth the harness. These companies are formed for a short period, from eleven to forty days, during which time, in accordance with a well known and long established order of proceeding, the lands of the different members are ploughed by turn, and when the time is up, the association is dissolved. For finally mellowing and breaking up the land and covering the sown seed, different kinds of harrows and drags, consisting very often of nothing more than an ordinary plank placed edge-wise, and drawn by cattle, are mostly used in the Transcaucasus. In mountain districts, and almost everywhere in the Koutais government, a hand spade is used to weed the sown land and to till kitchen gardens or even fields, especially when, owing to the inaccessibility of the land, the employment of cattle is impossible. The methods of working the soil are extremely varied, but notwithstanding the large amount of labour expended, they are in general very inadequate and unsatisfactory. This is, to a very great extent, to be explained by the peculiar incompleteness of the agricultural instruments in use. The tillage of the land on heavy loam, or on virgin or fallow soil, is performed with a Georgian plough; on irrigated land, or on light soils, with a peasant plough, the *sokha*. When the land has been ploughed, in all the lower districts of eastern Transcaucasus irrigating canals are dug either before or immediately after the seed has been sown, a work which requires no little expenditure of labour, but which none the less is performed with hand instruments.

For cutting grain, reaping hooks, generally with smooth edges, and more rarely scythes, are used everywhere in Transcaucasus, and sometimes the grain is plucked by hand. An *arbaba*, a two-wheeled cart, is used for carting the crop; but in mountainous places sledges are also used; where the mountain paths are very bad, as well as in the steppes, it is often brought home in packs; and in places quite inaccessible to cattle the poor farmer is often obliged to bring it himself at an expense of almost incredible labour and exertion.

In the majority of places in the Transcaucasus grain is thrashed on a floor erected in the field, or before the house, with the aid of a peculiarly primitive instrument, the

thrashing plank. This instrument is of an oblong shape and is turned up at one end, after the fashion of a sleigh, the under side of the plank being provided with several rows of sharp flint stones. When in use, a pair of bulls or buffaloes is yoked to the upturned end of the plank, and they drag it over the sheaves strewn on the floor, and the grain is shelled by the sharp stones. To increase the weight, the driver stands on the plank, and very often women and children are also placed on it, and sometimes heavy stones are piled thereon. In this way, the straw is cut up into little pieces and forms what is called *saman*, the principal article of fodder for cattle during the winter season. The grain is afterwards tossed into the air and, thus cleaned of all mixture, stones, chaff et cetera, falls through the sieve. In some places, the grain is thrashed by animals treading on the sheaves. The grain, when thrashed, is stored in pits, very seldom in barns or any kind of buildings erected especially for that purpose. In western Transcaucasia grain is in many places stored in tubs, which are piled up in one of the rooms at home.

Owing to the great variety in its climatic and other conditions, as many as forty different kinds of field plants, many of them limited to a few places, but others almost universally cultivated and ranking among the principal food products of the country, are grown within the boundaries of the Caucasus. The first place belongs to wheat, which in the shape of winter and spring wheats, is grown over all the Caucasus in large quantities, with the exception of the lowlands of the Koutais government and some localities of the Tersk province, where maize is more generally cultivated. Winter wheat is mostly sown in the lowlands; spring wheat in the hill plains, where it grows at a height of 6,500 feet; in places at the foot of mountains both kinds of wheat are sown. The former is sown on both watered and unwatered lands; the latter is chiefly sown on irrigated fields. Different sorts of wheat are cultivated, the greatest variety being found in the Transcaucasia. The hard wheat, such as yellow wheat in the Transcaucasia, and Kuban wheat in Northern Caucasus, are reckoned everywhere to be the most valuable. The wheat crops are in general satisfactory, from 50 to 80 pouds per dessiatine, and sometimes they reach from 100 to 200 pouds. The winter crops as a rule, are superior to the spring crops. The best wheat crops are met in the low lying districts of eastern Transcaucasia, where they yield as much as 200 pouds, and in the districts overflowed by the river Kura, the yield is still higher, 270 pouds per dessiatine.

Next to wheat, the most important grain cultivated in the Caucasus is winter and spring barley, which grows easily in higher regions than wheat, and in the hill plains, where it is generally cultivated, is found at a height of 8,100 feet. In all such places it forms the principal cereal. It is sown in much smaller quantities in the Koutais government, in western Transcaucasia, in the Tersk and Daghestan provinces, as well as in the lowlands of the Eriwan government. Spring barley is grown on unwatered grounds, and chiefly on the hill plains; winter barley, on both watered and unwatered fields, and chiefly in the lowlands. There are different kinds of barley sown. The crop varies from 35 pouds, on the hill plains, to 150 pouds per dessiatine, in the lowlands of the Eriwan province. In almost all parts of the Caucasus barley forms the principal fodder for horses.

Maize is mostly cultivated in the Koutais government, in western Transcaucasia, where, with the exception of the hilly districts, this plant forms the principal, and in places the only cereal food. The prosperity of western Transcaucasia depends therefore,

mainly on the maize crop, its kernel, in the shape of Georgian bread, forming in these parts of the country, the principal food of the population, and also the principal article among their food exports; whilst its stalks and husks, and sometimes even the grain, serve as fodder for the cattle. Among the other localities of the Caucasus, maize is mostly cultivated in the Tersk and Kuban provinces, and also in the Tiflis government; elsewhere it is but little cultivated, and there are places where it is not grown at all. Maize is sown from the end of March to the end of May, and on an average yields from 90 pouds per dessiatine, varying however from 50 pouds, as in the Tersk province and hilly plains of the Koutais government, to 215 pouds, as in the lowlands of the Koutais government.

Rice which in order to ripen requires a high temperature and a great quantity of moisture, flourishes best in the low lying places of south-eastern Transcaucasus, where there is a good supply of water for irrigation. More than elsewhere it is grown in the Erivan, Elisavetpol, and Baku governments. Rice is sown in April or in May, according to the soil conditions of the locality, and gives an average crop of 175 to 200 pouds per dessiatine; under exceptional circumstances, as in the Erivan government, the crop is one and a half times more abundant. Different sorts of rice are grown.

Millet of two sorts, *panicum miliaceum* (millet) and *panicum italicum* (Italian millet) is cultivated in the Caucasus. Millet (*panicum miliaceum*) is grown in large quantities in Northern Caucasus, particularly in the Kuban province, in some parts of the Transcaucasus, but chiefly and on the largest scale in the Elisavetpol government. It is grown on both watered and unwatered lands, in the lowlands and also in the uplands. It yields from 40 to 135 pouds per dessiatine. Gomi, as the Italian millet is called in these parts, is cultivated in many places of the Koutais government. A thick gruel made from millet serves as one of the chief articles of food for the native population.

It is only in the Transcaucasus that rye is cultivated to any large extent, and then only in places inhabited by Russian colonists. In Northern Caucasus, this cereal is seldom met with, being grown only in hilly plains, ill adapted for wheat growing. Spelt, *triticum amyleum*, buckwheat and oats are grown only in certain parts of the Caucasus. Spelt is grown in very small quantities in Northern Caucasus, and in parts of the Transcaucasus, lying at the foot of mountains, but is nowhere cultivated on a large scale. The growth of buckwheat is general among the Russian colonists of Northern Caucasus, chiefly in the Kuban and Tersk provinces, but is seldom found growing in the Transcaucasus, except in a few Russian settlements. Oats are grown to any large extent only in Northern Caucasus; elsewhere it is but little cultivated, since everywhere barley is used as fodder for horses. The cultivation of potatoes is fairly extended in the Kuban province and generally in Northern Caucasus, but in the Transcaucasus they are little grown, chiefly in the kitchen gardens of Russian colonists. Within a recent period, however, the cultivation of potatoes has been considerably extended in many places, and now forms a field crop.

An approximate idea of the growth and cultivation of the principal cereals in the different governments and provinces of the Caucasus may be formed from the following table. The figures indicate the crop yield in pouds in Northern Caucasus for the year 1892, when the crop was good, and in the Transcaucasus, in the year 1891, when the crop was moderate:

Localities:	Rye.	Winter wheat.	Spring wheat.	Oats.	Barley.
Stavropol gov.	3,045·6	24,293·0	6,595·0	2,686·3	5,159·2
Kuban pr. with Black Sea distr.	10,259·1	65,848·0	20,037·0	13,876·0	19,598·4
Tersk pr.	1,584·0	3,055·0	68·0	522·0	1,100·0
Daghestan pr.	—	2,468·0	305·2	88·0	923·2
Koutais gov.	—	854·6	94·7	—	213·8
Tiflis gov. with Transkatal distr.	—	12,182·8	3,447·5	104·1	5,208·8
Elisavetpol gov.	—	17,773·2	3,066·3	2·7	6,160·1
Baku "	—	17,682·0	241·0	—	6,510·2
Eriwan "	—	9,264·5	8,047·0	—	5,199·3
Kars prov.	—	2,241·0	—	—	1,428·0
Total . . .	14,888·7	155,662·1	41,901·7	17,269·6	51,501·9

Localities:	Millet.	Buckwheat.	Rice.	Maize.	Potatoes.
Stavropol gov.	1,684·0	9·6	—	2·0	485·0
Kuban pr. with Black Sea distr.	3,775·0	279·2	—	2,036·0	7,661·0
Tersk pr.	1,979·9	141·6	—	4,102·0	1,124·0
Daghestan pr.	—	—	44·6	204·9	29·8
Koutais gov.	—	—	—	16,452·7	20·4
Tiflis gov. with Transkatal distr.	627·1	—	414·4	893·7	1,213·2
Elisavetpol gov.	1,247·3	—	2,337·7	12·3	436·1
Baku "	387·0	—	1,361·0	—	45·0
Eriwan "	283·3	—	2,587·7	2·9	262·1
Kars prov.	—	—	—	—	—
Total . . .	9,987·7	430·4	6,745·4	22,706·4	11,277·6

From the above table it is possible to form a general idea of the proportionate produce of the most important grains in the Caucasus, as well as which kinds of crops are most cultivated in the different governments and provinces. If these calculations of the gross yield of all crops except potatoes be accepted, the net result for all kinds of grain for Northern Caucasus will be about 171,876,000 pouds; for the Transcaucasus, about 105,885,000 pouds, and consequently the total amount for the whole of the Caucasus will be about 227,761,000 pouds. If, further, from this total be deducted the quantity of grain required for the needs and nourishment of the population, which may be calculated at 13 pouds a head, it follows that the quantity of grain remaining over and above what is consumed by the population, amounts to not less than 180,000,000 pouds. Such is the extraordinary excess in cereals which the Caucasus, and principally Northern Caucasus, can dispose of in years when the crop is not below the average.

Of leguminous plants cultivated within the boundaries of the Caucasus may be mentioned several kinds of peas, *cicer arietinum*, *lathyrus sativus*, *phaseolus mungo*, *trigonella foenum graecum*, *lupinus albus*, and of long pods, *dolichos monochalis*, but they are all, with the exception of peas and long pods, to be found only in certain localities, and cannot be held to be of any importance, so far as field culture and field crops are concerned.

Different sorts of oil plants are also cultivated, and of these the sunflower is grown in certain parts of Northern Caucasus for the sake of its oil, whilst its seeds serve as a dainty. Flax is met with in the Transcaucasus, where it is grown for the sake of its oil, in the hilly tract of the Erivan government, and in a few other localities. In some parts of the Transcaucasus, and in a few other places, the peasants also cultivate it for yarn; wild mustard, garden cress, turnips, hemp, poppy, and the *lalemantia iberica* are also cultivated, but to no great extent, in parts of the Transcaucasus, and the hemp furnishes cable and rope yarn. The castor plant and sesame are more largely grown in some of the low lying localities of eastern Caucasus; and successful attempts have of late been made to grow the castor plant in parts of the Tersk province.

The first place among fibrous plants must, of course, be given to cotton, which is chiefly cultivated in the Erivan government. It is also grown in the Tiflis, Baku, Elisavetpol, and Koutais governments. Its cultivation in the Transcaucasus dates from the earliest times, and up to the present day the native genus of this plant, the common cotton plant, *gossypium herbaceum*, is grown in all parts, but is not remarkable either for its yield or for the quality of its fibre.

A few years ago attempts were made in the Transcaucasus to acclimatize Upland cotton, and with such success that at present more than half the native cotton is replaced by it. In the Transcaucasus, about 600,000 pouds of pure cotton yarn are produced, the half of which comes from the Erivan government, where the cotton plant is more and more cultivated, in many parts in place of wheat, barley, and rice. Each dessiatine produces the equivalent of about 15 pouds of pure yarn.

Tobacco, and particularly the different kinds of Turkish tobacco, ranks in many parts of the Caucasus among its chief articles of produce. In the year 1891, the tobacco plantations in Northern Caucasus extended over 10,775 dessiatines, of which 9,848 dessiatines were in the Kuban province; in the Transcaucasus, 2,377 dessiatines, of which 1,507 were in the Koutais government; giving for the whole country a total of 13,152 dessiatines. In the same year were gathered in Northern Caucasus 909,902 pouds of tobacco; in the Transcaucasus, 148,408 pouds; giving for the whole country a total of 1,058,310 pouds. The Turkish varieties form the principal kinds of tobacco grown, the American being as yet but little cultivated.

Saffron and madder are also grown, though not to any very large extent, in certain parts of the Baku government. It is in the district of the same name that saffron is mostly grown, and in twelve of its villages more than 1,500 families are engaged in its culture, the ordinary yield being 200 pouds of the dry product. A pound of saffron of the best quality sells for five to six roubles, the second sort selling from three roubles to three roubles and a half. It is often sold in Tiflis, but the chief market is in Persia. The culture of madder, which was at one time widely spread in eastern Transcaucasus, has greatly declined in recent days in consequence of the increasing demand for alkaliised

colours, and is now carried on, within very narrow limits, in the same government of Baku.

Fodder plants, such as ryegrass, *Lolium perenne*, lucern-clover, *cervum ervilia*, esparcet et cetera, are grown in many parts of the Transcaucasus; but it is in the eastern division that lucern-clover is cultivated to any important extent. Lucern-clover is grown on special fenced-in plots, or in gardens in the close neighbourhood of a colony, and yields a crop in the course of five to seven years. In low lying localities there are three mowings in the course of the summer; but in the hilly plains, by reason of the shortness of the growing season, only two. From 250 to 300 pouds of dry hay are gathered per dessiatine, and in a few exceptional cases almost double that quantity.

The so-called *bakhchi*, or *bashtans*, that is, watered plots of ground devoted to the growth of watermelons, muskmelons, pumpkins, and cucumbers, are of no little importance in vegetable culture in the low lying and warm localities of the Caucasus. On these plots, besides the plants already mentioned, are sometimes also grown onions, cabbage, and the like, though these are more often grown exclusively in kitchen-gardens. In these gardens, as well as in ordinary ones, are found plantations of melons, watermelons, and cucumbers; but they are grown in large quantities only on *bashtans*, which are generally made on the most fertile portions of the land, and where the above-mentioned crops are frequently grown alternately with other field produce. The *bashtans* are most common in eastern Transcaucasus, where, in certain places, the culture of melons is carried on to an enormous extent, sufficient not only to satisfy the local demand, which in summer is invariably great, since they form one of the principal food products, but also sufficient to supply town markets, where there is also a brisk demand for them. Numerous varieties of both muskmelons and watermelons are grown in fairly large quantities, some of which are distinguished for their exquisite taste; and to give them this taste forms a leading object of interest in their culture. Thus, for example, some kinds of melons, at a certain time during the period of their growth, are covered with earth.

Horticulture forms, next to agriculture, one of the most important, most ancient, and most widely spread occupations of the rural population of the Caucasus. The origin of horticulture in this country must be referred to a very remote period, the more so as very many of the more important fruits grow wild, and consequently their conversion into cultivated plants presents no particular difficulty. Of the different forms of horticulture, the most important and the most widely spread is the cultivation of fruit trees and fruit shrubs. The other forms of horticulture are but little adopted or practised in the large majority of localities. Notwithstanding the importance of horticulture for the whole country, it is impossible to affirm that this branch of rural industry is in a satisfactory state. The modes of culture, the choice of fruits to be grown, and even the proportions in which each kind is cultivated, are very far from being based on any rational system, are for the most part left to chance, and under the best of circumstances, cannot be said to correspond with the natural peculiarities of the country, which, generally speaking, are most favourable to horticultural pursuits. The modes adopted for preserving fruits are in most cases exceedingly primitive, and the dry oven, or any substitute for it, is very little in use.

At the same time, horticulture is practised in every part of the country where the climate only permits it, and separate garden grounds are to be found at a height of 4,000 or even 5,000 feet above the level of the sea. In eastern Transcaucasus, and even in parts of the eastern division of Northern Caucasus, the climate requires gardens to be artificially irrigated during the summer season; whilst in the western parts of the country the quantity of atmospheric moisture is sufficient. In consequence of these climatic conditions, horticulture in Northern Caucasus does not present any great variety in its modes and forms, and resembles in nearly every particular horticulture as practised in the southern tract of European Russia; whereas in the Transcaucasus, and especially in its western districts, where the climate is mild and frosts are rare, the garden plantations present every variety of growth. In these parts, nearly all the fruits of southern Europe, including olives and lemons, as well as some Japanese fruits are cultivated; and only date palms, for which the climate would seem to be too cold, do not flourish as garden plants in this region.

One characteristic trait of many places in the Caucasus is the numerous wild fruit trees growing in the forests, which, without being tended at all, or at best very little, bear the choicest fruits in great abundance. Such half-forests, half-gardens, are to be found in large numbers in Northern Caucasus, chiefly in the forelands, and in western Transcaucasus. In view of the low state of horticulture in these parts, it is often very difficult to distinguish where a forest with its inwoven vine shrubs terminates, and where the cultivated vineyard commences. According to the prevalence of these or other fruit trees and shrubs, the cultivated tracts of the Caucasus may be divided into vineyards where only grapes grow, fruit vineyards where fruit trees also grow in juxtaposition with vines, orchards where fruit trees predominate, and lastly, mulberry plantations or gardens where the mulberry tree is cultivated partly for the sake of its fruit, and partly for the purposes of sericulture. Besides fruit plants, vegetable beds and fodder grass plants are often found in gardens, and in the woodless districts of eastern Transcaucasus plantations of poplar, willow, elm, and other trees, which are generally cultivated for the supply of building materials, and seldom for mere landscape ornamentation. Lastly, in western Transcaucasus gardens often fulfil the functions of ploughed lands, and maize, millet, and other plants are grown on them.

Of all branches of horticulture, the most important in the Caucasus is the cultivation of the vine and its cognate industry, the manufacture of wine. It must, however, be remarked that the manufacture of wine is allied with the cultivation of the vine only in those parts of the country where Christians form the majority of the population; in places peopled by Mahometans, the grape is used either in its natural form, in the shape of dried raisins, or in preparing non-alcoholic drinks. The cultivation of the vine is spread through all the provinces and governments of the Caucasus, although not on an equal scale. This depends on climatic and other conditions, and also on the fact that the cultivation of this plant dates in some places, as in Northern Caucasus, from a comparatively recent period. The vine is, however, widely cultivated in the hilly tracts of the Caucasus, and ripens at a height of 4,500 feet, as in the Kars province. The earliest central point of vine cultivation appears to have been western Transcaucasus, where the wild vine grows in abundance, winding round the forest trees, and bears fruit without any effort on the part of man.

There are several modes of vine culture, two of which are most in favour. The one is to let the branches grow freely, and they frequently attain a very great length; the other is to crop them from time to time, and prop them up with stakes. In Northern Caucasus, the branches are covered in the winter; but in the Transcaucasus, only in those localities where the winter frosts might injure the plants. In the western division of the Caucasus, where there are heavy rainfalls, the vines are adequately watered by atmospheric moisture; but in the eastern division artificial irrigation has to be employed. There is a great number of varieties of the fruit; foreign grapes are mostly cultivated in Northern Caucasus, and native grapes in the Transcaucasus, though here too, within the last few years, foreign grapes are in certain parts largely grown. The modes of manufacturing wine have all a very primitive character about them, and it is only here and there, principally among proprietors, and seldom among the peasantry, that anything is found approaching to a rational mode of manufacturing wine. In spite of all this, however, the wines of many parts of the Caucasus, as in Kakhetia, are distinguished for their excellent qualities, and have already to a large extent replaced the use of foreign wines in European Russia.

The vintage crop, which is dependent on a number of conditions, varies very considerably, reaching 100, 300, 500, and even more, *vedros* per dessiatine. The largest crops are given by vines that are watered, but the wine made from them is not always of the best quality. The vineyards in Northern Caucasus cover about 20,000 dessiatines, giving about 3,000,000 *vedros*, of which more than one-half, owing to its inferior quality, is used in distilling spirits. The largest plantations are in the Tersk province, along the river Terek. In the Transcaucasus, the vineyards cover about 103,000 dessiatines, and give on an average about 10,500,000 *vedros* of wine. Kakhetia, in the Alazan valley, in the Tiflis government, forms the largest centre of the wine industry, and the Koutais government is also famous for its wines. A large quantity of the Caucasian wine is consumed at home, but a considerable amount is exported to European Russia, and a part of it is used in distilling spirits.

Pear, and still more, apple trees are the fruit trees most cultivated in the Caucasus, where they are grown in great varieties. The finer sorts of foreign growth have been successfully acclimatised only in the Transcaucasus; whereas in Northern Caucasus they suffer from and are frequently spoiled by the sudden changes of temperature, by hailstorms, by high winds, et cetera. The greatest variety is to be found in the pears and apples grown in the Akhaltsikh district in the Tiflis government. Not only pears and apples, but other fruits grown in western Transcaucasus are greatly inferior to those grown in the eastern division; the superiority of the latter being, in all probability, ensured by the drier and warmer climate of that region.

Apricots and peaches are grown in great varieties in nearly every part of the country, but the best are to be found in parts of eastern Transcaucasus, especially in the Nakhichevan district, in the Erivan government, where are grown nectarines and peaches in nearly every variety and unrivalled in quality. Apricots and peaches are used both in their natural and in dried forms. The apricot trees in many places attain enormous dimensions, and serve for all kinds of work in which durability, the special quality of the wood of this tree, is required. Of other fruit trees and fruit shrubs grown in many places may be noted cherries, wild cherries, different sorts of plums, and

also quinces. Raspberries, gooseberries, and barberries are grown in comparison more rarely. Pomegranates *p unica granatum* are cultivated to a large extent in the Elisavetpol government, and are to be found growing nearly everywhere in a wild state.

Chestnuts and medlars, *cornus mascula*, are seldom cultivated, since they grow wild in the forests. Walnuts are to be found in both a wild and cultured form, and are often of an unusually large size. Gall nuts form an article of considerable export. Little nuts, *corylus avellana et corylus colurna*, are to be found everywhere in the forests.

Almonds, but more rarely pistachio nuts, are grown in small quantities in parts of eastern Transcaucasus, and fig trees, *ficus carica*, are abundant in all parts of the Transcaucasus, its fruit being used as a fresh food and also in a preserved form. The common olive, *olea europaea*, is grown in large quantities only in two localities in western Tanscaucasus, a little to the north of Sukhoum on the shore of the Black Sea, and in the Artvien district of the Koutais government on the river Chorokh. Lemons, oranges, and mandarins are not grown anywhere in large quantities, but in the gardens on the shore of the Black Sea a few trees are occasionally met with.

Lastly, the mulberry tree, *morus alba et morus nigra*, occupies throughout the Caucasus an important place among the fruit trees of the country. It is grown in great variety and in great quantities, and the different parts of which it is composed bring no little profit to the Caucasian people. The leaves and young shoots of this tree serve as food for silkworms. No less than 34,000 dessiatines in the Transcaucasus are covered with plantations of the mulberry tree sown for this express purpose. From its leaves is obtained a yellow colour for dyeing wool and silk. With its bark the vine shoots are trussed. Its branches are employed for wattling and as vine props. Its wood is used for all kinds of articles. Its fruit serves as a food, either in its fresh natural state, or in the form of a syrup made by boiling its juice. From the fruit is also prepared vinegar, and from the fruit of the white mulberry a large quantity of spirit is distilled. In a word, the mulberry tree forms one of the most important fruit trees both in the Transcaucasus, and in the whole country.

With the culture of the mulberry is closely connected sericulture, or silkworm breeding, one of the most important and most ancient of Caucasian industries. Till the outbreak and spread of the silkworm rot, in the sixties, the silk industry was very widely developed in the Transcaucasus, but it has since become considerably diminished. At the present date, in consequence of different measures adopted by the Government, as the establishment of a silk-breeding station at Tiflis and a number of affiliated branches, the silk industry has recovered its former position, and the quantity of dry cocoons obtained yearly within the boundaries of the Caucasus amounts to 320,000 pouds. The methods still employed in steaming the cocoons, and unwinding the silk, are for the most part primitive and inadequate; but sericulture has none the less within the last few years made great progress, and in particular great improvements have been made in silk reeling, in which, besides a number of old fashioned looms, about 20 steam silk reelers are employed in the Transcaucasus. After home requirements, in the way of hand-made products, have been supplied, the remainder finds its chief sale in Moscow.

Passing on to kitchen gardening it is necessary to mention that the growth of vegetable plants for local requirements is well developed in nearly every part of the country, and most widely in numerous localities of the Transcaucasus, where its population

consumes a large quantity of vegetables and garden stuff, either in their natural state or for dressing dishes. The kitchen gardens are generally close to the place of residence, often situated in gardens between the trees, so long as they are young and do not overshadow the ground. A number of plants, some of which, as has already been remarked, belong also to field culture; muskmelons, watermelons, pumpkins, onions, potatoes, et cetera, are grown in them. But almost exclusively in these kitchen gardens are found different sorts of peas and kidney beans, tomatoes, *solanum melano gena*, *hibiscus esculentus*, radishes, turnips, carrots, beets, sunflower, *helianthus tuberosus*, garlic, different sorts of onions, cress-salad, celery, fennel, parsley, tarragon, *capsicum*, mint, *coriandrum sativum*, *ocymum basilicum*, cabbage, lettuce, et cetera. In town and suburban kitchen gardens the plants grown are still more varied. In general, kitchen gardening is restricted to the supply of local wants and has not as yet become a trade industry, though the dimensions it has assumed are considerable, owing to the large wants of the local population in respect to vegetables and garden stuff. As with all the other cultures, kitchen-garden vegetables are grown without the application of artificial irrigation in western Transcaucasus; but in the eastern division, and particularly in the hot, low-lying districts frequent and heavy irrigation is required.

As has already been mentioned the rural population of the Caucasus not only cultivate plantations of different fruit trees, but make use of wild fruits, which are so abundant in the Caucasian forests, and thus procure to themselves a healthy and inexpensive nourishment and dainty. Besides the fruit trees and shrubs, there are several wild-growing trees and bushes, or even grasses, to be found in different parts of the Transcaucasus the separate portions of which, the leaves, flowers, roots, et cetera, always find a ready sale and bring no little profit to the population. Thus, for example, in many parts of the Koutais government, the country people gather the leaves of the wild laurel, *laurus nobilis*, which, as is well known, are used in the preparation of numerous dishes. In these parts, the little tree, *staphylea colchica*, also grows wild. It is found in the gardens of central Transcaucasus, and its flowers are used for flavouring a favourite salad that is prepared for fast days. In western Transcaucasus, a good trade is done in some villages by collecting the leaves of the whortleberry shrub, *vaccinium arctostaphylos*, which are prepared like tea leaves, and serve as a substitute for teas of the lower quality.

In some parts of eastern Transcaucasus, the inhabitants gather the leaves, boughs, and fruit of the shrubs, *rhus cotinus* et *rhus coriaria*, which yield an admirable material for tanning hides, and also for making yellow, black, and red colours for dyeing. It is also in eastern Transcaucasus that within a recent period the so-called sweetroot industry has become an important and widely spread occupation. It consists in gathering and collecting the roots of this plant, the licorice root, for export, principally to the United States and to Great Britain. Licorice root, *glycyrrhiza glabra*, grows wild in the steppe districts of the Elisavetpol and Baku governments. It belongs to the genus of leguminous plants, and as is well known, licorice is obtained from its roots. Till quite recently, the inhabitants of these places were accustomed to gather only the green portions of the sweetroot for cattle fodder, and made no use whatever of the roots. But in 1885 some representatives of the firm, Khrusacki and Gizi, wishing to extend their trade, came to eastern Transcaucasus, and began to purchase the root from its inhabitants for export. A factory for drying and pressing the root was

built in the following year, since it was found to be less profitable to export it unpressed. A few years later, two English firms, Urghart, and Andrews & Forbes, began purchasing the root in still larger quantities and constructing factories for pressing the root and for preparing licorice from it. In this way, in the course of a very few years a large business was done in the root, and the inhabitants began to occupy themselves with digging up the roots and selling them to the factories. Elisavetpol, Oudzhara and Liaka, all of them stations on the Transcaucasian Railway, became the central points of the new industry, and offices, stores, and warehouses were opened at these places.

The sweetroot has a long vertical root, about two inches thick at the surface of the ground; it is dug out by the plough, commonly in use in these parts, or still oftener by an ordinary spade. The season for gathering the roots lasts about four months and a half, from November till the middle of March; from ten to fifteen kopecks per poud is paid by the factories. The roots are first cleaned in the factories from soil and other admixtures, then sorted and piled in stacks, and left to dry till the end of the following summer, when they are put under the press. The green roots yield from 40 to 50 per cent dry roots. The roots, when thoroughly dried, are press-packed in bales of from eleven to thirteen pouds in weight, and sent by rail to Batoum, whence they are shipped abroad. Caucasian licorice is not inferior to the best sorts sold at the international markets.

The quantity of roots gathered in eastern Transcaucasus is extremely large and increases each year. In 1887 about 360,000 pouds of dry roots were bought by different firms; in 1889, 1,000,000 pouds; and in 1890, more than 2,200,000 pouds. In 1891, 859,712 pouds were exported from Batoum, to the sum of 908,200 roubles, of which 671,580 pouds to the United States, and 163,930 pouds to Great Britain. The relatively small quantity of exported roots, compared with the quantity gathered, is to be explained by the fact that only dried and pressed roots are exported, and these necessarily are the roots gathered in the preceding year, or even earlier.

In bringing this short review of agricultural productiveness in the Caucasus to a close, it should be stated that during the last fifty years, from the time the authority of Russia was firmly established in the Caucasus, the country has been enriched with a large number of new plant forms which have been acclimatised in many parts of the Caucasus, particularly in the warm seashore tract of western Transcaucasus. A large variety of South European, American, Japanese, Chinese, Indian and Australian plants, many of them exotics, have been found to support the mild winter of the country. Of such plants may be noted, the eucalyptus, camelia, magnolia, different sorts of the accacia and palm, the bamboo, yucca, corktree, varieties of aciculated trees, and lastly the tea shrub, *thea bohea et thea viridis*, which easily ripens in these parts.

The Caucasus, in which are found such varied forms and modes of agriculture and horticulture, is equally interesting and remarkable for its cattle-breeding industries. On the one hand, the steppe plains of Northern Caucasus and eastern Transcaucasus, which are sparsely populated and in many places altogether unfitted for agricultural pursuits; on the other hand, rich mountain pasturages, extending for long distances over the hilly ranges of the country, enjoying a climate that permits its cattle to be kept for the most time on grazing fodder, and is in every way favourable to cattle breeding, which in many parts is almost the only, and in any case the principal source of liveli-

hood to its inhabitants. The different modes of pasturage adopted in the Caucasus are, therefore, the outcome and result of the peculiar features of its two principal tracts, the steppe and the hilly region. And though these modes present certain well-defined differences, they are none the less intimately connected one with the other, and are the necessary results of the climatic, soil and economic conditions of these two tracts.

In Northern Caucasus the system of pasturage, and the use it makes of the land, is developed in its simplest and most natural form among the nomads and semi-nomadic tribes of the steppe plains in the north-eastern districts. In other places it is an important branch of rural economy more or less closely connected with farming, and for some time, owing to the development of agriculture, the increasing ploughage of the steppes, and other causes, has betrayed a tendency to become more and more limited in its operations. In the Transcaucasus the pursuit of pasturage is considerably developed among the semi-nomads and nomadic tribes of the south-eastern steppe districts of that country. The low-lying steppe plains, in consequence of the hot dry summers, are only fit for cattle pasturage, and that only at certain periods of the year, namely, the autumn and winter. In the summer season these so-called winter pasturages, dried up in the fierce rays of a burning sun, are completely deserted and abandoned, and the whole population with their herds and flocks are driven, by reason of the grass being scorched and withered, to the mountains, where forage can be found for their cattle. When the autumn rains set in, the hitherto abandoned steppes are soon covered with rich grass and once more become lively and animated with countless grazing herds, that during the winter months, and right up to the following summer, find ample fodder on these wide stretching plains of verdure and vegetation. In those parts of the steppe region where, irrigating streams here and there spaces of tilled land; are found and it may be noticed that, wherever the supply of water is at all sufficient, agriculture invariably becomes more developed and is constantly rescuing from pasturage new and larger stretches of land. For this reason, pasturage in most places in the steppe districts of eastern Transcaucasus must be regarded as the dominant and prevailing rural industry only so long as the peculiar actual condition of things may last. With the introduction of a sound system of irrigation it must sooner or later give way to a more rational application of the best approved modes of agriculture, by which alone their inhabitants can be enabled to reap in all their fulness the rich fruits and produce of the land.

The high mountain tracts, which stretch for long distances along the Caucasian chain and the hilly region of Little Caucasus, generally called summer pasturages, are also employed as pasture lands, since they are altogether unsuited for agricultural pursuits in consequence of the severity of the climate. But whilst in the steppes the pasturage season is in the autumn and winter, in these mountain tracts it is in the summer. Owing to their elevated situation, which is far higher than the forest zone, the mountain meadows are exposed to a very harsh climate; the winter lasts some seven or eight months, during which an immense quantity of snow falls and there are constant storms of wind. On the approach of the short summer season all is changed, and the mountain pasture lands are scarcely to be recognized. The fresh mountain air, the clear, cold, crystal streams, and, above all, the rich abundant grass, on which the poor cattle, ill-nourished and badly fed during the long winter months, eagerly graze, all this

attracts the lowland cattle breeders, who quickly flock hither, and, running up summer huts for their temporary residence, occupy themselves exclusively with milk products and remain here till once more the first frosts and early winter storms force them to withdraw again, with their flocks, wives, children, and household goods, to their homes in the lowlands. In this way, the nomads and semi-nomadic tribes, whose exclusive occupation is cattle breeding, find themselves obliged, in order to obtain fodder for their cattle, to make two migrations each year: the first, on the approach of summer, up the mountains for summer pasture; the second, on the approach of autumn, down to the lowlands for winter pasture. These mountain pasture tracts, inasmuch as they are for the most part unsuited owing to the severity of the climate to the cultivation of the very hardiest plants, are not available for any other purpose, and will probably remain in the unmolested possession of cattle breeders; and the huge tracts occupied by them will, in all probability, always continue to be devoted to cattle breeding.

But cattle breeding, which is so widely spread in these two regions, the steppe and mountain plains, and which is the necessary consequence of natural climatic conditions, is also largely pursued in places where, owing to the abundance of water, agricultural operations are not only possible, but are even practised on a large scale by the population in general. This is particularly remarked in parts of the eastern governments in the Transcaucasus, and is the outcome and result of the peculiar conditions of their life. The nomadic, or semi-nomadic tribes inhabiting these places are so habituated to their wandering mode of life, and so accustomed to their favourite and traditional occupation, cattle breeding, that they care but little to occupy themselves with agriculture, however propitious the surrounding circumstances may be to such an occupation. At the same time, it must be remarked that, in consequence of the increase of population, the constantly widening extent of cultivated land, and many other circumstances, all of which are adverse to a migratory cattle-breeding life, the nomadic tribes of eastern Transcaucasus are little by little beginning to grow more settled, to sow and till the land, and by its cultivation to reap the benefits it is ready and able to afford them.

This gradual change from a nomadic to a more settled life may be noticed in all its different successive stages throughout eastern Transcaucasus. But in the other parts of the country, where the inhabitants have long been settled and have been accustomed to busy themselves with the cultivation of grain or with horticulture, cattle-breeding either occupies a secondary place, or being closely connected with agriculture, is of equal importance and significance. And notwithstanding all that has been just said, a great future awaits the cattle-breeding industry of the country, if only a rational use and cultivation of the enormous pasture tracts in the Transcaucasus be introduced and adopted, its summer pasture lands covering 2,870,000 dessiatines, and the winter pasture lands covering 1,700,000 dessiatines. And the same may be said of Northern Caucasus, where, in numerous places, the land, ill suited to agriculture, is admirably fitted for cattle breeding, and where there still are, and long will be, immense stretches of land on which cattle can be bred and kept.

The number of cattle raised within the boundaries of the Caucasus is extremely large; the adjoined table has been drawn up to give an approximate idea of the number of head of cattle in the different governments and provinces thereof.

Gouvernements and provinces.	Horses.	Asses and mules.	Horned cattle.	Buffaloes.	Sheep.	Goats.	Swine.	Camels.
Stavropol gov. . . . .	120,400	—	662,900	80	2,643,308	169,350	8,370	
Kuban pr. with Black Sea distr. . . . .	290,000	—	1,686,000	2,795,000	—	334,000	—	
Tersk pr. . . . .	173,000	4,400	878,000	2,000	2,339,180	113,300	2,650	
Daghestan pr. . . . .	46,700	33,000	292,600	24,900	1,486,650	168,760	160	
Koutais gov. . . . .	74,900	2,350	391,950	32,100	186,500	99,700	218,200	
Tiflis gov. with Zakatal distr. . . . .	103,700	510	607,400		1,295,700	77,700	400	
Elisavetpol gov. . . . .	76,140	35,500	414,500	59,200	1,156,800	75,200	35,300	800
Baku " . . . . .	73,400	14,900	223,400	31,600	738,150	21,400	11,400	6,550
Eriwan " . . . . .	35,600	26,600	314,500	21,600	584,450	88,500	600	5,650
Kars prov. . . . .	23,100	7,100	240,200		408,500	—	—	
Total . . . . .	1,017,640	124,360	5,882,930		14,082,800	960,000	24,420	

From the above table can be estimated the number of cattle in general in the different localities of the country, as well as the relative importance and extent of cattle breeding in this or that part of the Caucasus.

Several districts in the Caucasus are famous for their breeding of droves of horses, as the Kuban province, the Elisavetpol government et cetera, but in consequence of various unfavourable circumstances this branch of rural industry has greatly fallen off. The most celebrated races of horses bred in the country are the Calmuck and Kabarda horses in Northern Caucasus, and the Karabakh horses in the southern division of the Transcaucasus. Asses and mules nearly everywhere occupy a secondary place, though the latter, in consequence of their great powers of endurance, and their firm-footedness in traversing mountain paths, are sometimes valued very highly.

Horned cattle are held in great esteem in Northern Caucasus and in the western division of the Transcaucasus, but in the eastern division they give place to sheep and goats. In consequence of the great variety in the topographical, alimentary, and other peculiarities of the country, the cattle in the Caucasus are also very varied, and for the most part are composed of different varieties of Caucasian races. The best representatives of such races are the Osetin and Karabakh-Kazakh breeds. In Northern Caucasus are numerous Circassian, Calmuck, and Nogay types. In the Transcaucasus, together with cattle of local breeds, and which are far more numerous than the rest, is also found the Circassian breed among Russian colonists; and in the extreme south-east, on the borders of Persia, the humped zebu. Cattle are kept for their milk (in which respect sheep are also of great value in many places), for their meat, for breeding purposes (calves in the Caucasus are slaughtered only in towns and there but seldom), for their working strength, and lastly, for manure which also serves as fuel in the woodless districts of Northern Caucasus and the Transcaucasus. Different kinds of hay, steppe, mountain and grass hay, saman, straw, and maize stalks form the ordinary winter fodder; and it is seldom that cattle are fed on the leaves or branches of trees, and still more rarely on barley, bran, or maize. Cattle are kept in different ways. Among

the nomads and semi-nomadic tribes they are kept nearly the whole year grazing on green fodder; but cattle owners, who have settled places of residence, provide them with proper stables and sheds, and they are in all respects well tended, particularly draught cattle.

Buffalo breeding is, for the most part, limited to low lying places, since they are unable to support the cold. These animals replace oxen and cows in ploughing the land; they have great draught power, and give a milk which in many places is valued more highly than cow milk; in a word, their good qualities completely redeem any defects they may have. Buffaloes are kept and tended in most places with sufficient care; at any rate, better than ordinary cattle. The quantity of milk they give is considerably large, and the milking season lasts long. The milk contains as much as seven per cent fat. From it is made butter, of a white colour, and it is often coloured and sold for cow butter.

Sheep breeding is carried on to a large extent in the steppe regions of Northern Caucasus and in eastern Transcaucasus. Fine-wooled and fat-tailed sheep are bred in large numbers in Northern Caucasus, whilst in the Transcaucasus, sheep of local breeds are most numerous, such as the Toushine, Pshav, Karachai, Georgian, and others, chiefly distinguished for the facility with which they can be fattened, and the tastiness of their flesh, and not seldom yielding fine and soft wool. Mutton is of all meats the most common in the Caucasus, and sheep milk is used equally with cow milk in preparing a large number of milk products.

Swine breeding plays an important part in the live-stock industry of many places in Northern Caucasus, as well as in the Koutais government. But in eastern Transcaucasus where a Mahometan population predominates, the number of swine is not large, and in some places they are not to be found at all. Lastly, camel breeding is chiefly practised on a large scale in the steppes of the eastern districts of Northern Caucasus and the Transcaucasus, though in general this branch of the live-stock industry is fast declining in consequence of improved ways of communication, and other kindred reasons. But during the last years camels have been bred in the Kuban province and even in some of the governments of European Russia, as for example, in the Orel and other governments. Among the products of the cattle-breeding industry, wool and milk products occupy the first place.

Wool is partly exported to European Russia, and partly used on the spot in producing numerous hand-made articles, such as tissue stuffs, carpets, felt cloaks, et cetera, many of which articles, as for instance Daghestan cloth, are distinguished for fineness of work, and are highly valued. The milk industry also forms one of the more important occupations in the country. Milk (sheep, cow, goat, and buffalo milk) is used in various ways; in making butter and cheese the Caucasians have made remarkable progress. It would be difficult to mention any place in the world, where such a variety of milk products, and particularly cheese, is prepared, as in the Caucasus, and some of these products are made only in the Caucasus and nowhere else. It will, perhaps, be enough to mention kefir, the famous beverage, prepared by the fermentation of milk by means of a certain mushroom, and which is well known for its healing qualities. Lastly, it may be well to note that the preparation of Swiss cheeses, which has in other countries been unsuccessfully attempted, has been carried out in the Caucasus with complete and perfect success. The cheeses prepared in certain parts of the Tiflis government are in no respect inferior to Swiss cheeses, and are for this reason in great demand.

Among the other branches of breeding, apiculture occupies no unimportant place.

The Caucasus is in many respects favourably adapted to the raising of bees; but it is rarely taken up as a trade industry, and for the most part, is left to amateurs, or regarded as a convenient means of increasing the resources of a household. The culture of bees is practised in many places, and beehives are to be met with in large numbers both in Northern Caucasus and in some parts of the Transcaucasus. Wild bees abound in nearly every part of the Transcaucasus, especially in Abkhazia, in the Koutais government, where stores of wild honey are found in the hollows of trees and gathered by the inhabitants of the districts. Various kinds of honey are prepared, the best known being the so-called stone honey, white and very thick set, which is mostly found in the Osurget district of the Koutais government, and the heady honey, which has intoxicating qualities, and is gathered by the bees from the flowers of the cherry laurel, *prunus laurocerasus*, and from azaleas, *azalea pontica*, in the Batoum and Artvin districts of the Koutais government.

Considerable and even radical changes have within the last twenty years been produced in the economic life and particularly in the agricultural industries of the Caucasus. These changes have not only had an influence on the development and improvement of rural industries in many parts of the country, and have not only directed the attention and energies of the population to new branches of those industries, but have strengthened the ties of alliance between the Caucasus and Russia, an alliance having its source in both the exigencies of the interior provinces of the Empire and in the necessities of her distant frontier region. The extension of the Vladikavkaz Railway from Rostov to Vladikavkaz, with its branch lines to Novorossisk, and later to Petrovsk, as well as the railway from the Caspian to the Black Sea, the improvement and extension of good roads and highways, the construction of new ports, and the constant increase in the Russian element of the population and consequent development of the idea of citizenship, all this has not only called forth a fuller and completer use and application of the productive powers of the country, but has greatly contributed to and facilitated an abundant supply of her products both in the interior provinces of European Russia and in foreign lands. In a word, the Caucasus has not only become closely united with European Russia, but has secured for herself a prominent and permanent place in the markets of the world. In the fuller development of these relations the rural products of the Caucasus have played an important part, particularly its grain, the produce of which is constantly increasing, so that it both supplies all the wants of the home population and further leaves a considerable surplus for export.

This surplus is much larger in Northern Caucasus than elsewhere, and the abundance of its land justifies one in anticipating an increased growth of cereals and an equally great increase in cattle breeding, and particularly in sheep farming, both of which already form the capital industries of the country. From this point of view, Northern Caucasus may be regarded as one of the principal store granaries of European Russia, whence, in case of bad harvests in any of the governments, enormous quantities of grain could be procured. In the Transcaucasus, notwithstanding that there is also generally a surplus supply of grain, a large portion of which is sent abroad, an object of first urgency in the interests of the Empire is the promotion of an increased activity in the growth and preparation of different rural products, amongst which the most important are wine, silk, fruits, cotton, and some others.

## CHAPTER XXI.

**Rural Industries and Forestry of Turkestan.**

Characteristics of the country and its population; conditions of agriculture; cultivation of grain and other principal vegetable products; horticulture; sericulture; cattle breeding; timber and wood wealth of the country; the Transcaspian Railway; importance of Turkestan to Russia.

UNDER the name of Western, or Russian Turkestan, that is, the country of the Turks tribes, is included the enormous region extending over the western part of the Asiatic continent, from the Ural river and the Caspian Sea on the west to the Altai mountains and Chinese frontier on the east, from Persia and Afghanistan on the south to the Siberian governments, Tobolsk and Tomsk, on the north. The area of the country, with its rivers, covers 68,155·70 geographical square miles; about two-fifths of the area of the United States, and more than one-third of the area of Europe; the population, composed of, besides Russians, different Turks nationalities, Kirghiz, Turcomans, Ouzbecks, amounts to about 7,500,000 souls. Within these boundaries are situated the following provinces: Akmolinsk, Semipalatinsk, Semiretchensk, Syr-Darya, Samarcand, Ferghana, Turgai, the Transcaspian districts, and the eastern division of the Ural, besides two Khanates, which are under the protection of Russia, Khiva and Bokhara. The north-western division of this region, generally known as the Kirghiz steppe, is inhabited by Kirghiz, who occupy themselves chiefly with cattle-raising, and in part by Russians, whose principal occupation is agriculture. The south-eastern division has a more mixed population who occupy themselves with cattle breeding and also with the culture of various important rural industrial products; and this division, more often than the other portion of the country, is called Turkestan. In the latter use of the word, under the name Turkestan are included the Syr-Darya, Ferghana, and Samarcand provinces, to which may be also added the Transcaspian province, differing though it does from the other three in population and government, but having much in common with them in its natural characteristics, in its soil and climatic conditions, in its agricultural productiveness, and in other respects. The four provinces are not seldom called Central Asia. The extent of these four provinces is very great, covering altogether about 22,165·85 geographical square miles, with a population of nearly 3,000,000 souls. The area surface and population of each province may be thus tabulated.

Regions.	Geog. square miles.	Inhabitants per each geog. square mile.	Population, male and female.
Syr-Darya province . . . . .	9,162·82	125·5	1,150,000
Ferghana " . . . . .	1,676·60	465·0	780,000
Samarcand " . . . . .	1,252·12	600·0	750,000
Transcaspian " . . . . .	10,074·31	30·7	310,000
Total for Turkestan and Trans-caspian province . . . . .	22,165·85	135	2,990,000

The density of population is therefore very small, averaging 135 souls per square mile; whilst in the Transcaspian province the average number is not more than 30 souls per square mile, that is, one-tenth the density of the population of all Russia. This insignificant ratio of inhabitants is explained by the fact that both Turkestan and the Transcaspian province, which are little or not at all adapted to settled culture, and sometimes not even fit for habitation, cover an enormous tract and are either steppes or actual marshlands. These waste lands are sterile, and the Kirghiz and Turcomans, who form the nomadic population of the steppe districts, occupying themselves chiefly with cattle breeding, from the necessity of circumstances live in small and scattered hordes. As to the oases, which are well irrigated and fully adapted to a settled life, they are as a rule very densely populated; in the richest and most fertile of them there is exactly the same ratio as in England, that is, 6,000 souls to each square mile. The large majority of the population is composed of the primitive inhabitants of the country, Kirghiz, Turcomans, Ouzbecks, Tadzheks, Sartes, who profess Islamism; whilst the Russians, if the military element be excluded, who first settled in the country not more than thirty years ago, do not constitute more than 1·7 per cent of the entire population. At the same time, thanks to emigration and colonization, their number is quickly and constantly increasing. Russian emigrants settle for the most part in the Syr-Darya province.

By nature Turkestan is for the most part one huge stretch of waste uninhabited land. Nearly 80 per cent of its three provinces is covered with the argillaceous, saline, and sandy steppe wastes that lie in the north-west and west, and represent the remains of the bed of the long extinct basin of a large sea. The rest of the stretch abounds in huge mountain chains and elevations, forming a part of the Tianshansk and Pamiro-Alai ranges. To the extreme south-east, these elevations form one of the most remarkable mountain ridges in the world, Pamir. The Transcaspian province is still more of a waste; more than 95 per cent of its area is covered with stretches of steppes and sandy wastes, on the southern extremity of which rise the low mountain chain, Kouren-Dagh and Kopet-Dagh, branches of the Paropamise, separating the Russian dominions from Persia and Afghanistan. Thus there is, within the boundaries of one and the same country, heights covered with eternal snow, more than 20,000 feet above the level of the sea, and enormous stretches of lowland, lying to the west of the Caspian Sea, and 85 feet below the sea level.

The soils of the Aralo-Caspian valley, now included in Turkestan, are largely the result of its past history. Along the huge stretch, where once a sea flowed, the soil is

principally argillaceous and sandy, the former soil containing a mixture of salt and sometimes taking the typical form of salt marshes, the latter being very varied in its origin and frequently forming a moving soil, carried from place to place by the wind, and not only creating almost impassable wastes, but sometimes flooding cultivated fields and villages. At the foot of the forelands, in the deep valleys between the mountains, as also along the river valleys of Turkestan, Syr and Amoo, the most important soils of the country are met with, so far as rural industry is concerned, wood soil famous for its fertility and in places, as in the Transcaspian province, silicified wood soil. This soil, reaching in some places to a very great depth, forms the principal wealth of the country; if properly watered, it yields a magnificent crop of the most varied and precious produce; and lastly, it is the soil of the cultured oases, supporting three-fourths of the whole population of the country.

The climate of Turkestan, far removed as it is from the ocean and closed in on nearly every side by enormous stretches of dry land, is a continental climate. The average yearly temperature is comparatively high, ranging from 11·5 degrees Celsius, in the Amoo-Darya lowlands, up to 15·6 degrees, in Merv. The summers are very hot, cloudless, dry and long, lasting from five to five and one-half months; the autumns and springs are mild and rainy; and lastly, the winters are very open, often comparatively mild and with but little snow, though sometimes, even in the southern division of the country, as in Merv, there are frosts as low as -25 degrees Celsius. These frosts, however, rarely last long, generally for a few days only, and it often happens that the weather is warm in the winter season. The atmospheric depressions are everywhere weak, in many localities, the evaporation exceeds by many times the quantity of moisture that has fallen in the course of the year. Rains are comparatively frequent towards the end of autumn, during the winter, and in the early part of spring; from May they become very rare, and in many of the steppe regions, which are removed from the mountainous districts, not a drop of rain will fall during the whole length of the dry and hot summer. Dry winds from the north and north-east prevail during the hot season of the year, at a temperature of about 40 degrees Celsius, causing an evaporation so excessive that vegetation requires increased irrigation, whilst the rivers grow shallow, and in the end, the whole of the Turkestan basin slowly but gradually dries up. From what has just been said, the great significance can be perceived, in view of its peculiar climatic conditions, that water streams must have for Turkestan, since, without their application to the artificial irrigation of the fields, any regular system of agriculture would be inconceivable. The fertile wood soil yields good crops only on the condition that it is sufficiently watered. On the other hand, as will be shown later, seed is sometimes sown on dry unwatered land, but the result is always exposed to considerable risk; besides which, without irrigation, it is absolutely impossible to cultivate a number of valuable and important plants. In this way, water streams appear to be, for the whole of Turkestan, the source of healthy life, and the degree of prosperity, in many and different parts of the country, very often depends on their abundance.

These water streams are distributed very unequally. The eastern division of the country is watered by two very large rivers, the Syr-Darya and the Amoo-Darya; but the western division, including the Transcaspian province, has scarcely a river of any importance. The supply of water for irrigating purposes, supposing it to be duly and fully employed for that end, is more than sufficiently abundant both in the Syr and in

the Amoo; but only a very small portion is thus employed at the present day, and then principally in those localities where the two rivers, as they issue from the mountains, take a sharp decline in their course. In none of the other localities, except in the lower parts of the Amoo, where the Khiva oasis is situated, are these rivers made use of for irrigation, and they are allowed to flow for thousands of versts through the steppe region, where they fall into the Aral Sea, without any attempt being made to utilize them. The mountain tributaries of these rivers contribute far more to the irrigation of the land, canals being made to run from them through the fields in those parts of Turkestan that lie at the foot of the mountains. Lastly, the small shallow streams that flow from the mountains with a considerable decline in their course, and thus easily admit of being conducted along canals, play a far more important part in the irrigation of the soil. Each of these small rivers, as it flows from the mountains to a leveller course covered with wood soil, is divided into a number of irrigating canals which, spreading out fanlike over the sloping descent, frequently spend their last drop in irrigating the land, and bringing with them moisture and life to the fields and gardens of the oases. It is only owing to these shallow rivers and rivulets that the mountain ranges of Turkestan are bordered at the foot with an unbroken line of green oases, beyond which extend the gray yellowish steppes and wastes. Of the smaller rivers of the country, the most important for purposes of irrigation is the Zeravshan, an original tributary of the Amoo, which is diverted into a very large number of canals and forms a large flourishing oasis, one-half of which lies within the boundaries of the Samarkand province, and the other half in the Bokharian territory. There are fewer streams in the Transcaspian province than in that of Turkestan; only in its south-eastern division do the Tedzhen and the Murgab form small oases, and on its southern extremity, at the foot of the Kopet and Kouren-Dagh, there stretches a broken line of cultivated spots, watered sometimes by means of subterranean canals, sometimes by mountain streams. With the exception of these tracts, the country is all but nude of flowing rivers, and its enormous steppes and wastes can only boast of a few subsoil springs, which are partially turned to use by means of wells; but inasmuch as these wells are sometimes ten or even a hundred versts distant one from another, it is evident that they must be altogether unadapted to irrigating purposes. Such is a general outline of the distribution of water streams in Turkestan, and consequently of its cultivated oases, which are intimately connected with them and form the central points of the agricultural productiveness and industry of the country.

Beyond these watered localities, in places far removed from rivers and forelands, and in the steppe regions, where irrigation and consequently agriculture also and a settled mode of life are impossible, cattle breeding forms the sole occupation of the nomadic population. Unlike settled colonists, they are not confined within the limits of the watered stretches of the country, and habitually accomplish enormous marches with their herds, their only care being that the flocks should, as far as possible, have sufficient pasture, and of course sufficient water to quench their thirst. Besides cattle-breeding, they also occupy themselves with transport of goods by camels, and in a few places, but these are very exceptional cases, even with agriculture. Within a recent period, some of the nomadic tribes have betrayed an inclination to form settlements, but as yet such cases have been few and rare.

If then we confine ourselves to the principal occupations of its inhabitants, the

whole country may be divided into two large tracts. The first is the more important, and includes those portions of the country which are irrigated by rivers or which lie at the foot of mountains, and whose inhabitants are almost exclusively busied with agriculture. The great density of population, its comparative cultivation and comparative stability of its economical conditions, its incomplete and imperfect system of agriculture, the abundance of its field and garden products, its toilsome system of household economy, in these points consist the leading characteristics of life in the oases.

The second division of Turkestan, embracing the steppe regions, is on the contrary, distinguished by its low density of population and its partial cultivation, its abundance in all products of the cattle-breeding industry and its poverty in grain, the absolute dependence of the nomad on his foster herds, and the absence of any certain provision for the future. In the Transcaspian province, mainly peopled by Turcomans, the poorest of its inhabitants occupy themselves with agriculture, and reside constantly in the oases; whilst the wealthier of them, owning large herds, from the necessity of circumstances spend the greater part of the year in the steppes, where there is fodder for the cattle and fuel, and return to the oases only when the crops are ripening. For this reason, no strict division of the inhabitants of the Transcaspian province according to their habitual occupation can be made. Those who become poor through the loss of their cattle turn into settled agriculturists; whilst those who have grown rich and are the owners of large herds lead a nomadic life, though they always spend the sowing season in the oases, where moreover very often, at least a portion of their family, habitually reside.

The extent of watered lands in Turkestan is, in comparison with its whole area, by no means great, not more than  $2\frac{1}{2}$  per cent, the largest number of them falling within the province of Ferghana, and the smallest number within the Samarcand province. In the Transcaspian province, they occupy a very trifling extent, about 0·12 per cent of the area of the whole province. Put into figures, the watered lands of all the four provinces, Syr-Darya, Ferghana, Samarkand, and the Transcaspian, cover about 1,560,000 dessiatines, which gives about 0·5 of a dessiatine per inhabitant. If it be considered that in this half-dessiatine of waterland are included, besides the space sown with grain or other food products, the tree plots in the gardens, the mulberry plantations, the cotton shrubs, the pasturage, et cetera, it will appear that the actual quantity of watered lands in the whole country is altogether insufficient for the subsistence of its population. The deficiency in artificially watered lands is partially redeemed and made good by the cultivation of so-called bogarny fields which are generally sown with spring grain, chiefly wheat. This name, bogarny, is in Turkestan given to all sowings that are made on unwatered land, in the calculation that there will be a sufficient supply of winter moisture in the soil and a sufficient fall of rain during the spring. These lands generally lie on the skirts of the watered oases, and themselves remain unwatered because there is not sufficient water, or because the population is without the necessary means, or because they lie much higher than the range of irrigated land. Sometimes they lie on the mountain forelands, far removed from all cultivated areas, on a high level, with a fertile wood soil, but owing to their position, inaccessible for artificial irrigation. As after the winter a great quantity of moisture sinks into the earth from the rains and melting snow, and the months of March and April are generally rainy, the bogarny sowings generally succeed, owing to the moisture of the soil, in springing up, earring, and even ripening before the strong heats set in.

If the winter is a favourable one, so far as the supply of moisture is concerned, and if the rains are sufficiently frequent during the spring, the bogarny lands will give a satisfactory, and sometimes even a full crop; but if, on the contrary, the winter and spring prove dry, and but little rain should fall during the spring, the crop will naturally be poor, and at times even fail altogether. In the former case, that is, when sufficient moisture is expected, the quantity of land devoted to bogarny sowing, is very considerably increased, but in the latter case when but little moisture is looked for, these sowings are only made very sparingly. In this respect the bogarny sowings correspond with the sowings made in European Russia; but, in consequence of its climatic conditions, they are far more uncertain and risky in Turkestan. And this uncertainty comes out still more clearly, if they be compared with the sowings on watered lands: the former frequently do not come to seed, the latter almost always yield good crops. But notwithstanding the risk and the impossibility of guaranteeing in any way a good result, the bogarny sowings are much in favour in Turkestan, since, in the absence of watered lands, they are the only available resource for the population. In some places bogarny sowings occupy one-third, or one-half of all the land sown, and in the three provinces of Turkestan 700,000 dessiatines, or a little less than one-half of the area covered by watered lands, are sown in this way. As the most important food products, wheat, barley and millet, are sown on unwatered, or bogarny lands, it will easily be understood that a failure of these crops, especially if coincident with a failure of water in the irrigating canals, which occasionally happens in consequence of the small quantity of snow that falls during the winter in the mountain districts, necessarily involves a rise in the price of grain, and if the failure be complete, brings about a famine.

The deficient quantity of watered lands, which compel the population to have recourse to bogarny sowings, arises partly from the lack of irrigating streams in general, but chiefly from the unsatisfactory state of everything relating to irrigation, and the incomplete development of a rational and practical system. The deficiency of water for irrigating purposes is particularly felt in the Transcaspian province, where, even when full use is made of all the water at the service of the population, it is hardly possible to expect any essential increase in the quantity of irrigated land. To tell the truth, though in places there is very little water, the comparatively small extent of watered land in Turkestan is to be explained by the unsatisfactory way in which actual irrigation is carried out, and by the fact that very far from all the water available is utilized for purposes of irrigation. The natives, whilst they have proved that they are capable of availing themselves of little rivers for the organization of an effective system of irrigation and in some cases have obtained excellent results, seem to be incapable of carrying out any scheme of irrigation on a large scale, a shortcoming that must be attributed partly to their lack of scientific knowledge and partly to their want of means. It is only thus that it can be explained why the Syr and the Amoo, the largest rivers in Turkestan, are scarcely put to any use in irrigating the fields. Were new irrigating canals, running from these rivers, to be excavated, a new irrigating system to be organized, and the system already in use to be properly carried out, a considerable increase in the quantity of watered land might be anticipated, and a consequent diminution in the extent of bogarny sowing, with a more active cultivation of the principal food products on irrigated fields. The question of improving and developing the irrigation of land in Turkestan and

in the Transcaspian province has already been raised, and in no very distant future will probably receive a practical and satisfactory solution.

From what has been said, it may be gathered that in the four provinces there are about 1,560,000 dessiatines of watered and 700,000 dessiatines of b o g a r n y land, making in all 2,260,000 dessiatines, or 2 per cent of the whole area of the country, and giving to each inhabitant 0·75 dessiatine of cultivated land in general, with and without irrigation.

The natives divide the land they cultivate into field land, which is generally far from their homes, and vegetable land, which is always near to the places of residence. Field land is devoted to the growth of the most varied field produce, and vegetable or garden land, which is always surrounded by a clay fence, is sown with kitchen vegetables, hemp, tobacco, lucern-clover, or used as an orchard or vine plantation. Sometimes plots of land surrounded by clay fences are met with far away in the fields, in which case they are nearly always sown with lucern-clover, although the alternate system of sowing is not practised, since this plant will grow on one and the same ground ten years running and yield annually from five to six crops. A regular systematic change in sowing cultivated plants is, speaking generally, unknown in Turkestan; grasses and broad-leaved plants, it is true, are alternately sown, but this is sometimes a matter of pure chance, sometimes in accordance with a systematic order, but most frequently the result of experience, or as other circumstances dictate. Thus, for example, it is a recognized custom to sow lucern-clover in the same field at intervals of not less than four years, during which time the field will be sown with sorgo, melons and watermelons, and twice with a winter crop of grain. In many cases, particularly in the neighbourhood of cities, where the land can be easily irrigated and manured, the sowings follow one another uninterruptedly; but on the lands of the larger farmers, and in places where water and manure are scarcer, a field is allowed to lie fallow. In this case the three year system, which is in general widely spread, is adopted. Winter wheat or winter barley, which ripens towards the end of May or in the beginning of June, is then sown on the manured fallow field. After the crops have been harvested, the field is sown with a second crop, with phaseolus mungo, maize, millet, carrots, lentil, olive plants, et cetera. In the following year, it is sown with spring crops, most often with rice, sorgo, cotton, and also flax, muskmelons and watermelons, and onions. After the spring crops have been gotten in, the field is let lie fallow. But this order of things is frequently broken through, and rice, cotton and sorgo are often sown two years running in the same field after it has been manured. Sometimes, after the winter crops, particularly barley, the field is resown the same year with rice, with does not ripen till the beginning of October. This graduated change of sowings does not exclude, as has already been shown, the cultivation for many successive years of one and the same food product on a field whose soil is suited to its growth.

This yield is obtained by the aid and application of either animal or mineral manure. Very often, however, the fertile wood soil requires nothing more than irrigation of its surface area or the light wood dust, which is carried in the air and settles on the ground. The fertility of this soil is indeed extraordinary, and exceeds that of the black earth. Already are heard fears expressed as to the probable exhaustion of the black earth soil; but in Central Asia, the wood soil, that for thousands of years has yielded the richest harvests, still continues to give crops equally rich. Its fertility is to be explained by its penetrating force, reaching in places to hundreds and even thousands

of feet, by its physical and chemical composition, as well as by the circumstance that it assists in the separation of the mineral constitutions of the irrigating water, and in the settlement on the fields of the wood dust with which the Central Asiatic atmosphere is charged. The first of these circumstances is an essentially important factor in the maintenance of the soil's fertility. For in this way the soil in Turkestan and throughout Central Asia is constantly being enriched by fertilizing substances without the help or cooperation of man and in obedience to the natural climatic conditions of the country. None the less manuring is practised in these parts, since the soil is not everywhere equally good, and its uninterrupted cultivation must in the end tend to exhaust it. The most generally used manure in Turkestan is the soil itself, that same wood soil, which is carried to the fields from the neighbouring mounds, broken clay fences, and hillocks. Very often the silt obtained in cleaning the irrigating canals is scattered over the soil, after it has lain in heaps for two or three years. The manuring of the fields with earth is frequently carried out on a very large scale, and results in a complete and radical transformation of the arable stratum. The manuring is generally carried on through February and March; it demands an immense amount of labour and a large number of hands, since sometimes not less than 3,000 to 18,000 pouds of earth are required for one dessiatine. It is in this way that the atmospheric manuring of land, by means of the settlement of wood dust, which is so abundant in China-Turkestan, on the other side of the mountains, has been replaced in the Russian districts, where the wood dust settles only in small quantities, by artificial earth manuring. As to animal manuring, it is by no means in general use. In the cultivated oases the cattle-breeding industry is very limited in its extent; and consequently, it is only in the neighbourhood of towns, or in densely populated centres, that it can be procured in sufficient quantities. In such localities, horse, sheep, and horned cattle manure, generally sweated, is carted in the proportion of 3,000 to 4,000 pouds per dessiatine, and is strewn over kitchen vegetables, melons, watermelons, lucern-clover, and sometimes over cotton plants. But little need be said concerning the manuring of bogarny, or unwatered fields, on which manuring is not practised; and in view of the excessive abundance of such land, each year fresh new plots are chosen for culture.

In the Transcaspian province, where the agricultural cultivation of the land is less developed than in Turkestan, recourse is now had to fertilizing only in rare cases, and the Turcoman farmers trust exclusively to the natural fertility of the soil. Both the three crop system and the fallow system are practised in different parts of the province.

In Turkestan the land is tilled after the most primitive fashion and in exactly the same way as it was tilled some thousand years ago. Modern perfected agricultural machines are found only in those places where Russian cotton planters are settled. With the mass of the native population the omatch and ketmen are still in use. These two implements, indeed, are universally employed over all Central Asia. The omatch is a wooden plough of the simplest construction, with an iron plough-head, but without a mouldboard, and consequently barely upturns the earth to a depth of one foot, and not touching the layers of the soil. A pair of bulls, horses, or camels is put to the long yoke, which is sometimes eight feet in length, and occasionally camels and horses are yoked together to the same plough. A plough of this kind is worked with great expense of strength, works unsatisfactorily, and will not plough with

the same cattle more than one-sixth of a dessiatine. It is, however, extremely cheap, not costing more than 1 rouble 50 kopecks, plough-head included. The insufficient tillage of the soil is partly redeemed by repeated ploughings; no matter what the crop may be, the land is ploughed never less than four times, and with crops of sorgo, tobacco, and winter grain, still oftener; a careful farmer will see that the land is ploughed ten or even fifteen times. In this way, the farmer, with his queerly primitive implements, will succeed, through frequent ploughings, in clearing the soil of weeds, and preventing the formation of a crust surface, called *spekanie*, that is common to dry soils and is extremely injurious if it be formed before the crops sprout. The second of these implements, the *k etmen*, a kind of hand pick, is very characteristic of the country, and is universally used in different agricultural operations. With the native it takes the place of a plough. With it furrows are formed, irrigating canals are cut, the crust surface of the wood soil is destroyed, the land is mellowed, weeds are raked up, dikes are made, and roads are levelled. The natives are very skilful in the use of a *k etmen*, which in their hands replaces the plough, and with it they turn up and break the soil after the lucern-clover crop has been gathered in. It is of the greatest use to small farmers, who have not the means to work their fields with a plough, to do which requires a couple of strong animals. With this same instrument they are accustomed to mellow the ground, by turning it on one side, or they simply employ a plank, on which a man stands to give it the necessary weight. The land is intermittently harrowed and ploughed, as well as after sowing the seed, which in this way is covered with earth. Grain and lucern-clover are cut with an *ourak*, a kind of undented reaping-hook which acts like a knife; and with it the wild growing prickly plants are cut down for fuel. Sickles are but little known to the natives. Thrashing is carried out on a specially constructed floor by bulls or horses who tread out the spread sheaves. In the Transcaspian province, wheels toothed all round are used for this purpose. After the grain has been separated from the ear, the rougher straw is raked with five-pronged pitchforks, and the grain is winnowed by tossing it up with a shovel to the breeze. The finer straw remaining on the floor, and called *saman*, is used for mixing with the soil, and also for making unbaked bricks, as well as for fodder for cattle.

The quantity of water necessary for irrigating vegetation during its growth varies considerably, and depends on the nature of the plant and its need of moisture, as well as on the character of the soil on which it grows. For example, the maize is generally watered once or twice during the whole period of its growth, whilst a rice field must be kept under water for a continuous period of 90 to 100 days. Moreover, in the northern division of the country, where the summer is not so hot, vegetation naturally requires less water than, for instance, in the Transcaspian province, where in consequence of the excessively hot and rainless summer, the fields require to be oftener irrigated. Besides, near the mountains the spring rains last longer than in places far removed from them, as in the steppes, and therefore, in the former case, a more moderate amount of watering is sufficient. Lastly, the abundance or deficiency of irrigating rivers has a great influence on the frequency with which fields have to be watered; where there are many, the normal amount of watering is exceeded, where there are few, the amount is diminished to the lowest possible degree. Thus, for example, the Turcoman-Saryks, in the Yolatan oasis, in the Transcaspian province, generally water the spring wheat four times, but in case of deficiency of water, only three times,

and if the lack of water is excessive, not oftener than once. Besides the waterings during the time of growth, the fields are generally watered before sowing the seed. Thus, when winter grain is sown, the first watering is in the autumn, in September or October. A large supply of water for the irrigation of the fields is, therefore, required from March till September; the largest quantity of water being required for the winter sowings at the beginning of this period, that is, in April, and for all spring sowings and for gardens during the remainder of the period. The largest quantity of water used for this purpose in all the provinces of Turkestan is in June, and in the Transcaspian province in May. To give an idea of the number of these waterings, the quantity of water employed for different vegetations, and the relative extent of ground that is sown, a few data are appended referring to one of the richest oases in Central Asia, the valley watered by Zeravshan, in the Samarcand province.

Nature of vegetation grown on the watered land.	Proportion of oasis cultivated.	Square versts.	Number of irrigations.	Quantity of water used for irrigation.
				Cubic sagenes.
Rice . . . . .	0·13	327·21	{ under water 90 days.	213,864,456
Rice, second sowing after winter grain . . . . .	0·3	755·1		
Winter sowings . . . . .	0·4	1,006·8	3	43,493,760
Orchards, gardens, lucern-clover and millet. . . . .	0·12	302·04	8	34,795,008
Sorgo. . . . .	0·29	729·93	6	63,065,952
Cotton . . . . .	0·06	151·02	4	8,698,752
Various second sowings . . . . .	0·11	276·87	2	7,973,856
Total . . . . .		3,548·97		371,821,784

Among other things, it is learned from these data what an enormous quantity of water, in comparison with other vegetations, is required by rice, which for this reason can be cultivated only in places where water is abundant. And in fact the cultivation of rice is always a criterion of the comparative abundance of water in a locality. Where rice is grown there is much water, and where it is not grown there is a deficiency of water for purposes of irrigation.

The number of plants cultivated in Turkestan, as will have been seen from what has been said, is extremely great; the variety being, of course, greater in those localities where the climate is milder and warmer, as in the valleys, at the foot of the mountains, or in the steppes, as in the Merv oasis. On high levels, plants that only flourish in a warm climate gradually disappear, and on the frontier elevations, from 7,000 to 8,000 feet above the sea level, little vegetation is found other than wheat, barley and black oats. On a still higher level, as in the lofty vales of Tian-Shan and the Pamir, agriculture ceases entirely, and only the luxuriant grasses and herbage attract cattle-breeding nomads for the short summer season.

Wheat is the principal cereal of the whole country. The settled colonists for the most part cultivate winter crops on watered fields, whilst both they and nomads cultivate spring crops on bogarny, or unwatered fields, the nomads cultivating the

latter almost exclusively. Spring wheat is only under exceptional circumstances sown on a watered field. Winter wheat is generally sown in the middle of September or in October, sometimes as late as in the last weeks of November. When sown thus late, the grain does not begin to sprout before spring, and in this way, an intermediate crop, between the winter and spring crops, is obtained. Winter wheat ripens towards the end of May or in the first weeks of June. Spring wheat is sown on *bogarny*, or unwatered land, in the end of March, and ripens in June; the same grain is grown on watered lands chiefly in the Transcaspian province, and is sown in the beginning of April, in March, or as in Merv, even in the end of February. The crop is gathered in towards the end of May. Several different sorts of winter and spring wheat are cultivated; some of which are characterized by interesting features, though they have not as yet been submitted to any strict analysis or study. Under favourable circumstances, the winter wheat sowings yield good crops, far in excess of those obtained in European Russia and in the United States. On an average, one dessiatine yields from 120 to 140 pouds (12 to 14 chetverts), of winter wheat, and in exceptional cases as much as 160 or 200 pouds. Spring wheat, which is sown for the most part on *bogarny*, or unwatered lands, yields crops inferior to those of winter wheat, though if only the quantity of soil and atmospheric moisture are sufficient, the average crops are fair and satisfactory. It is reckoned that one dessiatine will yield from 60 to 90 pouds, that is, an excess of the average produce in European Russia. The crop produce of winter wheat varies very slightly; whilst in the case of spring *bogarny* sowings, the variations are extremely great; indeed, under unfavourable conditions, the latter do not even come to seed. The grain is ground in water mills of the simplest and rudest construction.

Barley is one of the most important food products of the whole country, inasmuch as it forms the principal fodder for horses. As with wheat, so with barley, there are spring and winter sowings. Winter barley is generally sown on watered lands; but, as it does not require much moisture, and it is sufficient if the soil on which it grows be irrigated once or twice, it is mostly cultivated on the skirts of the oases. The time of sowing and the season of the year at which it ripens, almost coincide with those of wheat, though barley ripens a little earlier. The crops vary but little; the average yield being from 100 to 150 pouds per dessiatine. Spring barley, which is principally sown on unwatered lands and by the nomadic population, yields crops of a very uncertain and unequal quantity, below that of the winter sowing, but under favourable conditions as much as 150 pouds or even more per dessiatine. In the Transcaspian province, spring barley is sown on artificially irrigated fields, in which case it ripens a little earlier than wheat.

Rice is the principal food grain cultivated in spring sowings, and is grown on a large scale in many parts of Turkestan. Unfortunately, it is dear, and therefore not procurable by the poorer farmers, who are very seldom able to use it in preparing their favourite dish, *plov*, or stewed rice. As rice requires a very long time to ripen, about four months, and also an enormous quantity of water, since a rice field ought to be under water from 90 to 100 consecutive days, it will be understood that it can be grown only in low, warm localities that are provided with an abundance of water. For low unhealthful localities rice is an invaluable food product that cannot be replaced, and the cultivation of rice habitually codates with the first steps taken in the general cultivation of a district. Rice has, further, the great advantage of not being an exacting

produce, and requires little if any manuring. Among the serious disadvantages attending its culture must be noted the circumstance that rice fields, whilst they injure the soil, are apt to become in the height of summer mere hotbeds of malaria, for which reason the inhabitants of those places, where there are large rice plantations, generally suffer from ague and fever. Rice is generally sown in April or in the beginning of May, and ripens in September. Sometimes it is sown on a field immediately after the barley or wheat harvest has been gathered in, and then it is not sown till the beginning of June, and is ready to be cut in October; but this can only be done in the warmer regions of the country. Rice generally yields large crops, the average produce being from 200 to 250 pouds, and sometimes as much as 300 pouds per dessiatine. Different qualities of rice are sown, of which the two principal sorts are red rice and white rice.

Two kinds of millet are grown in Turkestan and the Transcaspian province: *panicum miliaceum* and *panicum italicum*. In consequence of the comparatively short period within which it ripens, millet is much grown both in the low lying localities as well as in the higher regions, since it will grow at a height of 7,000 feet above sea level. The settled colonists generally make millet their second sowing, after the winter wheat or barley crop, and they sow it in June, in which case it will ripen in September or even in October. But generally millet is sown in April, and ripens in July or in the beginning of August. As the other kind of millet, *panicum miliaceum*, requires but little care and little irrigation, the Kirghiz nomads sow it in large quantities, and it forms their principal food. If the crop is an ordinary one, it will yield about 100 pouds per dessiatine; but with a good crop the produce will be almost double that quantity. There are different sorts of millet, of which the earliest are sown after wheat, and the latest after the barley harvest. It is from millet that the nomads prepare their bouza, an intoxicating drink. It is but little sown and cultivated in the Transcaspian province.

Sorgo (*sorghum cernuum*) is an important food product, sown in the spring, and cultivated on a large scale, principally in the Ferghana and Transcaspian provinces, and forming an article of food for the poorer classes, but chiefly used as fodder for horses and certain domestic birds. Its stalks, reaching sometimes four arshines in height, are used for fuel; and whilst young, as green fodder for cattle. The field on which it grows is well fertilized with sweated animal or earth manure; the sprouts are twice cut down and pruned with the ketmen, and the soil is watered from three to six times, according to the quantity of water available. Sorgo grows very slowly; if sown in the middle of April, it will not ripen till six months later, in the second half of October, and the roots are often frost-bitten. There are, however, it would seem, certain kinds of sorgo that come to full growth much more quickly, and which ripen within a period of three to four months; these are cultivated in different parts of the Transcaspian province. The average crop of sorgo may be reckoned from 200 to 250 pouds, the finest at 500 pouds per dessiatine. In many places sorgo, cut down when still young, is used as green fodder for cattle; for which purpose it is sown sometimes alone and sometimes together with millet and maize. Sorgo soon exhausts the soil, but at the same time it cleanses it of weeds.

Maize is but little cultivated in the country. It is sown in small quantities in places bordering on lucern-clover fields or in kitchen gardens, and its grain serves rather as a dainty than as an essential food product. In some places it is used as green fodder.

As to rye and oats, the cultivation of which is of the first importance in European Russia, they are never grown by native farmers and are cultivated only by Russian colonists, principally in the Syr-Darya province. Oats, however, are grown in parts of the mountain regions of Turkestan, and in the upper districts of the Zeravshan black oat grass grows at a height of 8,000 feet above the sea level.

Precise returns of the produce of the above mentioned cereals in Turkestan and the Transcaspian province cannot be given, since no statistics of their rural industries have till a very recent period been kept. Some idea of the crops yielded by the principal cereals may, however, be formed from the following table, in which are noted the approximate number of pouds brought in by the winter and spring wheat, and by barley, rice, millet and sorgo, in the three provinces of Turkestan and in the Transcaspian province.

Province.	Winter and spring wheat.	Rice.	Barley.	Millet.	Sorgo.
	Crops reckoned in pouds.				
Syr-Darya . . . .	3,600,000	2,500,000	952,000	518,000	163,000
Ferghana . . . .	5,263,000	5,147,000	690,000	850,000	2,855,000
Samarcand. . . .	14,816,000	1,832,000	5,700,000		5,280,000
Transcaspian. . . .	1,700,000	—	300,000		—

In reference to these figures, it must be remarked that the returns for the Samarcand province make no difference between millet and sorgo; thus, under the figure, 5,280,000 pouds, are included millet, sorgo and it may be, a further number of leguminous plants. The returns for the Transcaspian province are still less definite; rice, millet and sorgo are, at least in certain places, sown in this province in considerable quantities, but there is no possibility of giving precise figures for each of these separate crops. If barley be excluded, which is almost exclusively used as fodder for horses, and grain used in sowing other crops, it appears that much less remains over for the alimentation of the population than is the case in European Russia. And if it be further taken into consideration that sorgo is principally used as fodder for cattle and is only partially employed as food for the poorer classes, and that a very large quantity of wheat, flour and rice, is sent into the neighbouring provinces of Bokhara, the conclusion will be reached that still less remains for the alimentation of the population, and that in any case there is a lack of provisions to meet the necessary requirements of the people. This insufficiency of grain is made good, partly by the use of different leguminous plants, but chiefly by the enormous quantity of vegetables and fruits, and these form throughout the country essential articles of food and nourishment. In the summer season, when melons, watermelons, apricots, peaches and grapes are ripe, nearly all classes of society make of them their habitual food, with the addition of a little bread; whilst in the mountain regions of the country a kind of meal made from mulberries forms an important article of daily food. The people, moreover, are by nature moderate and temperate eaters, two or three slices of melon, a flat corn-cake, and a few cups of tea being amply sufficient for an adult.

Several kinds of leguminous plants are cultivated in Central Asia, partly in fields

and partly in kitchen gardens, such as, *lathyrus sativus*, *cicer arietinum*, *dolichos monochalis*, *ervum lens*, *phaseolus mungo*. The grain of these plants is used for human food; their stalks, to feed cattle. Of all leguminous plants, the most widely cultivated is *phaseolus mungo*, which is grown in nearly every part of the country. It is generally sown as a second sowing, after the winter crop, in May or June, and takes from three to four months to ripen, according to the climatic conditions of the country. It does not require to be watered more than once or twice, and almost always yields a good crop, up to 90 to 95 pouds per dessiatine. The straw is used to feed sheep, and the grain forms a favourite and ordinary food.

Among oil plants are grown sesame, *sesamum indicum*, flax, saffron, *carthamus tinctorius*, garden cress, *camelina sativa*, the castor bean, *ricinus communis*, the cotton shrub, the poppy, the sesame, *sesamum indicum*, being the most important of them all; it is generally sown as the second sowing after the winter wheat crop has been gathered in, requires but little water, and yields on an average from 40 to 60 pouds per dessiatine, and under favourable circumstances twice as much. Oil is pressed from the seeds of the sesame, and its stalks are used for fuel. The natives scarcely ever prepare pure sesame oil, but generally a mixture of sesame, garden cress and cotton seed, so that if badly refined, the oil gives any dish seasoned with it that peculiar odour with which every traveller in the East is so well acquainted; but, when properly prepared, it has rare qualities. Of other oil plants, flax is cultivated in small quantities, and exclusively for the oil; but garden cress is to be found very rarely, and it is only lately that it has been grown at all in Turkestan. As far as safflower is concerned, the plant is grown in parts of the Samarcand province; its flowers yield a red dyeing colour, and from its seeds an excellent oil is extracted. In most cases, oil is prepared in small factories constructed and arranged in the most primitive fashion. Cattle are fed with different brans, sesame bran being regarded as the best and most valuable. To these oil plants must be added hemp, whose yarn however is used within very narrow limits, exclusively for ropes. The seeds are employed to prepare oil, whilst from its flowers is extracted hashish, which possesses a strong stupefying power, and is used for smoking with tobacco, or taken internally in the shape of sweets. Poppy is but little cultivated; from the oil, extracted from its seeds and from its heads, after they have been steeped in water, is prepared a narcotic drink, called *kuknar*. Opium is never prepared at home, but is imported from Cashgar, and opium smoking, being forbidden, is but little practised.

Of all the fibrous plants, the cotton shrub is the most valuable and the most important, not only for the country of Turkestan, but for the whole of Russia. It has been cultivated in Central Asia from time immemorial. Long before the Russians settled in Turkestan, the native genus of the plant, *gossypium herbaceum*, had been grown on a large scale, and its yarn, which was not of a very high quality, formed the chief material in the preparation of the stuffs generally employed by its inhabitants for articles of clothing. After the annexation of Turkestan to Russia, attempts were made to acclimatize Upland cotton, *gossypium hirsutum*, and these attempts, though for a considerable while fruitless, were at the end crowned with complete success. At the present time, more than half of the cotton cultivated in Turkestan is Upland, and it is in no wise inferior to average cotton, or even to cotton above the average, imported from the United States. At the same time, the cotton plantations are

much larger than they were, and each year they increase in extent, so that there is every reason to believe that in the future Turkestan will supply, if not all, at least a good half of all the cotton required for Russian manufactures. At the present moment, the cotton plantations in the three provinces of Turkestan cover 100,000 dessiatines, three-fourths of which are devoted to the growth of Upland, and only one-fourth to the growth of home cotton. The extent of cotton plantations in 1890 and the crops they yielded of pure yarn are set forth in the following table.

Province.	Upland.	Native.	Upland.	Native.
	Dessiatines.		P o u d s.	
Syr-Darya. . . . .	18,100	1,900	227,806	1,900
Ferghana . . . . .	34,820	18,649	604,000	206,000
Samarcand. . . . .	5,939	11,469	93,900	132,000
Transcaspian . . . .	800		12,000	
Total. . .	91,717		1,294,806	

As has already been pointed out, cotton is now cultivated on a much larger scale, and in 1893 the plantations covered much more than 100,000 dessiatines, whilst the production has increased in a like proportion, and may be approximately calculated at 2,000,000 pouds. In the Transcaspian province, notwithstanding all the favourable climatic conditions, cotton cultivation advances slowly, in consequence of many secondary circumstances, but primarily because of the little aptitude shown by the Turkestan population for plant culture, and because of the lack of water. But the native population and Russian settlers are both engaged in the growth of cotton, the former chiefly as small planters, the latter on a far wider scale. The cotton shrub in general grows a good crop, requires but little water, from three to four irrigations, and forms for the whole country one of its most profitable crops, with every promise of a brilliant future. Its seeds are used to prepare oil, and its stalks for fuel. The cotton is cleaned of its seeds either by hand machines of the simplest construction, or by gins ordered from the United States of America, or manufactured in European Russia. All the cotton remaining after the home demand has been met, is sent to the different markets of European Russia by the Transcaspian Railroad.

No other fibrous plant, except cotton, is grown to any extent in Turkestan. In a few places mallow hemp, *hibiscus cannabinus*, is to be found in small quantities on the skirts of fields, and from it is produced a long durable yarn; whilst the Siberian dogbane, *apocynum sibiricum*, grows wild along the shores of the Syr and Amoo. From it the native fishermen make strong cables and nets that are very durable and damp proof. The dogbane, when properly prepared, gives a fine, bright yarn. Lastly, in some localities attempts have been made to acclimatize sorrel, *boehmeria*, and jute, *cörchorus textileis*. Up to the present nothing positive can be said as to the result; but to judge from trials that have been made in

Tashkend and in Petro-Alexandrovsk, in the lower parts of the Amoo-Darya, the alpha, *stipa tenacissima*, has taken to the soil very satisfactorily.

Of the dyeing plants, madder, *r ubia tinctoria*, deserves particular mention. It is grown on specially manured and well-tilled grounds in parts of the Ferghana and Samarcand provinces. Its roots are dug out four years after the plant has been sown, and on an average 180 pouds of dry roots are extracted per dessiatine, and are used for dyeing stufs and skins.

Tobacco is also grown in small quantities on specially manured grounds divided into beds. The natives, according to the kind of culture employed, divide tobaccos into two sorts: *a k*, that is, white, and *k o k*, that is, green. The former is used for smoking; the latter, as a snuff. Smoking tobacco is but little watered, its stalks, cut off with the leaves, are left to dry on the field for two or three days, and then the leaves are torn off and closely packed in a pit where they ferment under a covering of carpet or some silken stuff. After eight or ten days the tobacco is taken from the pit, left to dry for some time in the air, and then packed in sacks. A dessiatine yields from 96 to 120 pouds. Tobacco is smoked almost exclusively from nargiles. Snuff tobacco is heavily watered every second week. The stalks, cut down with the leaves, are hung to dry in the shade, after which the leaves are torn off, and pounded in mortars to a powder. The tobacco thus prepared is partly used as snuff, but principally to be chewed. Some time back, attempts were made to grow Turkish and American tobacco, but as yet this cultivation is restricted to a few Russian planters, notwithstanding that the Turkish tobacco grows easily in the country, and yields crops of unquestionably good quality.

The cultivation of hops was introduced by Russians into Turkestan, but up to the present day they have been but little grown and are to be found chiefly in the immediate neighbourhood of Tashkend.

Lucern-clover, *medicago sativa*, var. *t urc estanica*, is the chief fodder produce in use throughout Central Asia, and to the settled population of Turkestan is of the highest importance, since during the summer it forms the chief, and in winter, prepared in the shape of hay, the only fodder for cattle. It is of all the greater importance, because within the region populated by settled inhabitants there are no meadows. Soft herbs and other grasses that grow up in the early spring in certain parts of the steppes are quickly dried up by the hot rays of the sun, and give place to coarse, prickly stubble, or in any case to less nutritive grasses, that are in general unfitted for sheep, camels, or steppe cattle, and still less fitted for horses or the cattle of those who are settled in the oases, and are thus closely confined to the forelands or rivers and in most cases are far removed from the steppes. As has already been mentioned, lucern-clover is in most cases grown on special fields generally surrounded by clay-loam walls, and situated as near as possible to the places of residence. The ground set apart for lucern-clover is ploughed ten times, sometimes beginning with the autumn, and is heavily fertilized with animal or earth manure. In April, when the sowing generally takes place, water is turned on the field from the canals, and the lucern seeds are sown in the water. After the water has partly soaked into the soil and partly evaporated, the seeds begin to sprout. A few days after they have risen above ground, the field is again irrigated, the watering being repeated once a fortnight up to the first season for mowing. The lucern which is mown with a sickle, is then bound in sheaves, and is ready for sale. After the crop is cut, the field is watered two or three times for the second mowing,

which is generally the last of the first year of lucern culture. In the second year, lucern yields from three to four crops, each more abundant than those of the first year, and the field is watered early in the spring as well as after each mowing. In the third year, the field is again manured, generally in spring before mowing operations are begun, and also watered, as in the preceding year. Beginning with the third year, lucern gives from five to six crops during the period of its growth; and these crops on an average yield as much as 500 pouds, and in exceptional cases even 1,000 pouds of dry hay per dessiatine. Full crops, provided the land be manured every second year continue to be given from seven to nine years, at the end of which period it is usual to sow more largely, as the quantity of the crops begin to decrease. But as a rule, lucern can be sown on one and the same field for a period of twelve and even fifteen years, though of course the crops for the last few years will be poor. Under especially favourable circumstances, the period is longer; thus, not long ago, in Ferghana, plots of ground were to be seen that had been continuously sown with lucern from the time of the sovereignty of the Kokand khans, and which still gave more or less satisfactory crops.

The native lucern would seem to be a cattle fodder that cannot be replaced in countries so dry and so hot as Turkestan and the Transcaspian province. Parallel experiments that have been made in the Merv oases, in the Transcaspian province, in sowing native and French lucern, under widely different conditions of water supply, have shown that the native lucern, particularly where there is a lack of water, is vastly superior to the French in the crops it yields, and that it is able to grow satisfactorily with a minimum supply of water, a supply so small that European lucern would perish from drought. This peculiarity of the native lucern is to be explained by its peculiar formation. It possesses a very large root system, and its leaves are covered with thick down; this, in conjunction with a deep-cut orifice on the leaf, enables the plant, on the one hand, to imbibe the moisture from the deeper layers of the soil, and on the other hand, to exhale it in a very small quantity. After the last crop of lucern has been ingathered, the field is ploughed with a *k et me n*, and generally sown with cotton or melons, as these plants grow luxuriantly after lucern. It is only after an interval of four years that lucern is again sown on the same ground. A portion of the three years lucern is left for seed, and will give 50 pouds of seed per dessiatine. Sometimes the lucern is grown on a field sown from the autumn with winter wheat, but after this has been harvested it does not permit more than two mowings.

The most important of all tuberiferous plants grown in European Russia, the potato, was quite unknown in Turkestan and the Transcaspian province before the Russians settled there. According to some authorities, however, it had been grown in a few places by the Tartar residents of Tashkend. At the present time, it is to be found occasionally on the grounds of Russian settlers, and then almost exclusively in kitchen gardens.

In passing on to garden plants, it is necessary to remark that kitchen gardening is cultivated only by the settled residents of the country, who in many localities have brought this branch of husbandry to a high state of perfection. None the less the different methods of raising vegetables in hotbeds were unknown before the Russian occupation of the country. The plants grown in kitchen gardens are extremely varied in kind, namely: melons, watermelons, pumpkins, cucumbers, carrots, onions, garlic, beets, radishes, turnips, capsicum, tomatoes, nightshade (*solanum melanogena*), salad, parsley, cabbage, long pods (*dolichos monochalis*) et cetera; but only a few of these

are grown in large quantities, or rank among the important produce of the country. To such plants belong melons, watermelons, cucumbers, pumpkins, carrots, and onions. The first place among the latter plants must be assigned to melons, which are grown everywhere in large quantities and form the principal food article for the natives in the summer season. Melons, watermelons, cucumbers and pumpkins are grown either on kitchen grounds called *k h a y a t a*, especially prepared close to the place of residence, or in a field of spring grain, which in such cases is called a *b a k h c h a*. These *b a k h c h a s* are ploughed ten times and heavily manured; the seed is sown in rows, and the chief care paid to them is to see that the ground is well dug and watered every fortnight, or oftener in case of there being a good water supply. There are different kinds of melons, watermelons and cucumbers; but the watermelons and cucumbers are inferior in quality to those grown in European Russia, whilst the melons are magnificent. Pumpkins of two sorts are to be met with: the common pumpkin, which is used as an article of food, and the bottle gourd, *c u c u r b i t a l a g e n a r i a*, which is used in the preparation of many different articles. According as their shape permits, from these pumpkins are made water bottles and vases, vinegar and oil casks, tobacco pouches, nargiles et cetera. Onions and carrots are sown in the spring wheat field, the former independently of previous sowings, but the latter more often as a second crop after winter wheat. Only the large bulbous onions, seldom spring onions, are used for food; and carrots are employed to season dishes, among others the favourite *p l o v*, or stewed rice.

Horticulture, notwithstanding the favourable climatic and soil conditions, is far from being in a satisfactory stage of development, and is practised only in the form of fruit culture, that is, the cultivation of fruit trees and shrubs that supply the population with a large quantity of fruit which they eat both fresh and dried. The culture of room or greenhouse plants is a thing unknown in Turkestan; and in general, flowers are cultivated on an extremely small scale. All such forms of horticulture came into practice only when the Russians settled there, and up to the present are concentrated in their hands. Nearly all the fruit trees and shrubs known in Central and Southern Europe, with the exception of the *c i t r u s* genus, either grow or admit of being grown in Turkestan and the Transcaspian province, but only a few of them are cultivated. A Turkestan garden represents a portion of land, surrounded with a high clay loam wall, along which are planted poplar and willow trees (*s a l i x*); the remainder of the garden is devoted to lucern-clover, melons, watermelons, or more rarely vegetables, or is sown with grapes, apricots, peaches, mulberries, not so often with quince, pears, plums, apples and fig trees, all these being generally planted without any fixed plan or order. A large plantation of poplar or willow trees is very often to be found in gardens, where they are grown for the sake of the timber they produce, as well as for the fuel they furnish. Under the thick foliage of the older trees, the elm, *u l m u s*, the plane, *p l a t a n u s*, the apricot and mulberry tree, the natives are wont to rear and fence off a small space where carpets are spread on hot days, and where they take their rest, or *s i e s t a*. The choice of flowers which are occasionally grown in these gardens is very limited. Sweet basil (*o c y m u m b a s i l i c u m*) the favourite plant throughout Central Asia, garden balsam (*b a l s a m i n a*) from which is prepared a red dye for the nails, the mallow (*m a l v a*), the marigold (*c a l e n d u l a*) the lady's comb, *c e l o s i a*, and more seldom dog grass and the aster, are plants almost always found in the garden.

Of all the fruit plants the most widely grown are apricots, peaches, grapes and

mulberries. Apricots and peaches of various kinds are cultivated, some of which have a delicious taste, and if not superior, can at least hold their place with the best grown in Europe. Without any exaggeration, Turkestan may be called the land of apricots and peaches. An enormous quantity of these and other fruits, both when fresh as well as after they have been dried in the sun, is consumed by the population, whilst a brisk trade is done with the nomads in dried peaches and apricots. They are also sent for sale to the neighbouring countries. Grapes of various sorts are also cultivated, some of these varieties being admirably suited for the manufacture of wine. A large quantity is employed in the preparation of raisins. In consequence of the severe winters, vines are nearly everywhere covered before the winter comes on. As its inhabitants profess the Mussulman creed, there was no wine manufactured in Turkestan before the Russians occupied the country, and grapes were eaten either fresh, or in the shape of dried raisins, or lastly, in the form of a syrup decocted from the juice. Soon after the annexation of the country to Russia, attempts were made to manufacture wine from the native grape, and these trials were attended with such success that, at the present day, throughout the country, and chiefly in the larger cities where the Russian population is concentrated, about 100,000 vodros are prepared every year. Samarcand and Tashkend are the central points of the wine manufacture. The Turkestan vineyards cover 20,000 dessiatines.

Both kinds of the mulberry tree, *morus alba* and *morus nigra*, are grown in large quantities in Turkestan. Their leaves are used to feed the silkworm, and the berries are eaten either fresh or in the form of a thick syrup, which is decocted from the juice of the berry. Of far greater importance is the flour, called *t o o t - t a l k a n*, which is prepared from the dried berries of the white mulberry and forms during the winter the principal article of food for the inhabitants of the upper parts of the Zeravshan, in the mountainous districts of Turkestan.

As to the other fruit trees, different kinds of apples, pears, plums and cherries are grown, but they are very inferior to the European fruits; besides, pomegranates, marshmallows (*eleagnus*) figs (*ficus carica*), almonds, walnuts, pistachio nuts, et cetera, are cultivated. Walnuts and pistachio nuts are, however, seldom grown in gardens, the fruit being generally gathered from wild trees which abound in some of the mountainous, but not very high regions of the country. As has already been said, dried fruits, apricots, peaches, grapes, form a principal article of food and also an article of home and foreign trade; but in spite of this, the fruits are dried everywhere by the most primitive means, in the sun. The consequence of this is, that the dried fruits are neither thoroughly cleaned nor of any great value. Drying fruit in stoves is up to the present little practised, except in Tashkend, where some Rieder drying-stoves are employed. Fruit culture in general and the preparation of dried fruits have in Turkestan a great future in reserve for them, and without doubt these industries will in time be greatly developed. Horticulture has made but little progress in the Transcaspian province.

Sericulture represents one of the most ancient branches of village industry in Central Asia, and is of the highest importance for the settled population of many localities in Turkestan. Women alone occupy themselves with raising silkworms, and in most cases the worms are bred after the primitive fashions. Not only are there no well ventilated or properly arranged places for breeding the worms, but the process of vivi-

fying the eggs is very often performed by the women carrying them about with them, wrapped in rags. The litter for the worms is seldom, and sometimes never changed. In general, the worms are bred in a most unsatisfactory manner, and the consequence is that the process is dragged on far too long, and the crop of cocoons is poor and meagre. And yet, notwithstanding all these unsatisfactory surroundings, silkworm breeding in earlier times flourished in Turkestan, and not only was the home demand for silk for weaving and other purposes constantly supplied, but a large quantity was sent to the markets of European Russia. With the arrival of the Russians, better methods of silk-reeling were introduced, and a great improvement was effected in the hitherto unsatisfactory quality of Turkestan silk; apparently silkworm breeding has every chance of becoming still more perfect and still more flourishing. But unfortunately, in consequence of the spread of the silkworm rot, which found only a too favourable soil in Turkestan, the manufacture of silk began quickly to decline, and in the seventies, as in the years between 1880 and 1885, it fell so low that the export of this product into European Russia was reduced to the lowest limit. In view of these unfortunate circumstances energetic measures were taken by the Government to protect the silkworm breeding industry in Turkestan. Egg stations were opened to supply healthy eggs of different species, and means were adopted for instructing the people in a rational and scientific method of breeding silkworms. There are at present in Turkestan four egg stations, at Tashkend, Samarcand, Margelan and Petro-Alexandrovsk, which have already accomplished much in the advancement and improvement of silkworm breeding. It is, however, still but little developed in the Transcaspian province, and the modes of breeding silkworms are still more primitive than those in vogue among the native tribes of Turkestan.

Attention has already been directed to the divisions of the Turkestan population into two great groups: the settled residents whose chief occupation is husbandry, and the nomadic tribes, whose lives are mainly devoted to cattle breeding. Such a division is perfectly correct in general terms, but at the same time requires to be explained, in as much as the settled inhabitants from the force of circumstances have to breed domestic animals; in the same way, nomadic tribes, under favourable conditions, sow at least different kinds of cereals, such as millet or barley, and sometimes even wheat. Nevertheless, if the settled resident almost always has his horse, ass, and sometimes one or two heads of horned cattle, at least one-half of the nomads sow no kind of grain whatever, and are entirely dependent for their subsistence on the settled inhabitants of the country. In the Transcaspian province, as has already been shown, no sharp line of demarcation can be drawn between the settled Turcomans and the nomads; the superiority of the former over the latter in their economic relations must be evident. The whole fortune of a nomad consists in his herd of cattle, and for this reason a nomadic population must be less securely provided for, and the future of their households must be more precarious, than is the case with a settled population. This comes most plainly in view whenever any misfortune befalls their cattle. Amongst the calamities that from time to time overtake the nomads may be mentioned the glazed frosts, with the appearance of which the steppe becomes covered with an ice-crust, from under which the cattle are unable to get their green fodder and often perish in large numbers from hunger.

From this point of view, the conversion of the nomads into settled residents, and

the securing to them of a less precarious life, become questions of the greatest importance and urgency. Any such conversion was a thing quite unknown twenty-five years ago, but has within a recent period become a circumstance of ordinary occurrence. The pacification of the country under Russian rule, the great increase in the quantity of land cultivated by settled residents, the murrain among the cattle, produced by frosts, the expulsion of the nomads by new settlers in places suitable for a regular mode of life, and many other secondary causes have had for their result a gradual decline in cattle breeding over the whole extent of the steppes of Turkestan. This decline has been most pronounced in Ferghana and other places very near to mountains and consequently to a settled population. It is only natural that nomads, who have suffered serious losses in their flocks, should be forced to settle on the land and devote themselves to husbandry, where it is possible to do so. The land, exclusively occupied by nomads in the Kazalinsk and Perovsk districts of the Syr-Darya province, amounted twenty-five years ago to not more than 7,000 dessiatines of sowed land, whereas it now amounts to more than 100,000 dessiatines. The same is to be remarked in Ferghana, where it is possible to trace and follow up the successive phases in the transformation of a nomadic life first into a semi-nomadic, and finally into a settled mode of life.

This conversion from a nomadic into a settled life is naturally effected very gradually and very slowly. In some cases, owing to unfavourable local conditions, it has been checked, as for example, through a lack of places fit for agricultural pursuits, the insufficiency of any water supply for irrigation purposes, or lastly, the difficulty of irrigating the soil and conducting the water on the fields. Thus, in the central and lower parts of the Syr-Darya, the extension of cultivated land is greatly hindered by the fact that at this particular point the river flows in a deepened channel, and consequently it is impossible to conduct the water through canals over the fields. It is, therefore, necessary to raise the water by means of very primitive hydraulic machines, which are put into movement by the current-action of the river, or by means of draught animals; that is to say, very nearly in the same way as the Egyptians of old irrigated lands that lay above the overflow of the Nile.

In spite of all the circumstances which have been mentioned as forcing the nomads to occupy themselves with husbandry, the larger number of them, under the influence of the traditions and customs of long ago centuries, will for some time to come continue to be essentially cattle breeders. They are the more inclined to be such, inasmuch as the wide stretches of steppe and the mountain plains of Turkestan are, in the larger number of cases, altogether ill suited to agricultural pursuits and admirably fitted for cattle-breeding.

And in truth, on the one hand, the steppes, stretching over the whole of the north-western and western divisions down to the Caspian Sea, are ill watered, but covered almost everywhere with a fair growth of grass; on the other hand, high mountain valleys and mountain plains rich in fine pastures that are little suited to a settled life, but on the contrary, capable of supplying all that is necessary to promote the development of a cattle-breeding population. In the steppes, far removed from the mountains, the nomads traverse with their flocks enormous distances, as much as 1,000 versts in a year, keeping close to the water tracts in their search for fodder; whilst in districts lying near to the mountains, as in Ferghana, they ascend the mountains, and in the heat of summer reach heights of 11,000 feet above the sea level, and then gradu-

ally descend into the valleys, as autumn and winter approach. Lastly, the Kirghiz, living in the Pamir, nomadize during the summer on heights reaching 14,000 feet, in order to escape the gadflies and mosquitoes, and pass the winter on elevated points of 11,000 feet. In the mountains of Tian-Shan and in the Pamir-Alai many stretches of good pasture land may be found; but in this respect the valley of Alai, to the south of Ferghana, bears the palm, extending as it does over more than 1,500 square versts, and lying at a height of 8,000 to 11,000 feet above the level of the sea. In this valley the snow begins to melt towards the end of May, and commences to fall again in September, and not seldom, when the nights are cold, covers the ground even in the middle of summer, the temperature frequently rising in the day to 25 degrees Réaumur, and falling to zero in the night. But the whole Alai valley is covered during the short summer with such a rich and abundant pasture grass, that the flocks of 65,000 Kirghiz graze upon it, after having passed along the rugged mountain roads that lead from Ferghana, and after having crossed a number of heights eternally buried in deep snow.

Among the Turkestan nomads, cattle are fed and kept in the most primitive of ways. Cattle sheds or stables of any kind are to be found only among the settled residents, the nomads keeping their flocks in the open air the whole year through. In winter, to protect their flocks from frost and wind, the Kirghiz try to encamp in hollows, among bushes, or in places covered with rushes; and in extreme cases, they construct wattled pen-folds, or dig out pits for the calves and lambs. The nomads scarcely ever lay up a winter stock of provender, and in truth there is no place whence they could get it, since it is impossible to mow the scant grass of the steppes. The cattle, therefore, have to graze in the open throughout the year, and only for the camels is a small quantity of straw and reeds laid up, since being unhoofed animals, they are unable of themselves to rake up fodder from under the snow. Lucern-clover, as has been already stated, forms the principal provender for cattle in the oases. Nor do the animals fare very much better in the summer season; during the terrible heats they ruminate the sun-burnt grass, drink brackish water, of which there is generally an insufficient supply, and when night comes on, are exposed to a sharp change of temperature, the hot sultry days often changing into fresh cold nights. Under such circumstances, the cattle are constantly subject to maladies, and even to the murrain, which frequently during the winter frosts assumes alarming proportions.

In the following table is set forth the approximate number of cattle in the Turkestan and Transcaspian provinces.

Animals:	Samarcand Province.	Ferghana Province.	Syr-Darya Province.	Transcaspian Province.
Horses . . . . .	108,800	152,400	334,000	77,900
Horned cattle . . . . .	140,500	174,400	311,000	34,100
Sheep and goats . . . . .	472,700	630,000	3,100,000	1,890,300
Camels . . . . .	30,000	10,200	285,000	91,500
Asses . . . . .	43,400	9,200	23,600	11,200

Central Asia has from time immemorial been famous for its horses of a wild and ancient breed, *equus przewalskii*, which are still to be found in its eastern

borders. And though horse breeding, once so widely spread, has in the present day considerably declined, it still forms one of the most important branches of the livestock industry. The horse is not only used by the native to convey him and his goods from place to place, but its flesh serves him as food, and the milk of mares is employed in the preparation of koumiss, the favourite drink of the Turcomans. Besides this, the skin of horses is used in the manufacture of numerous leathern articles. The two dominant and principal breeds of horses in Central Asia are the Turcoman argamak, or race horse, and the Kirghiz breed. A cross between the Turcoman and Kirghiz, called the Karabayer breed, is also widely spread. The Turcoman steed is to be found chiefly in the west, in the Transcaspian province, and in Khiva; the best Karabayers, in Bokhara and throughout the eastern and northern districts of Turkestan. There is a considerable mixture of Arab blood in the Turcoman horse, which is extremely graceful in its form, requires careful breeding, is used only in the saddle, is distinguished for its speed, but is unable to support long marches. Unfortunately, this breed of horse is far from being numerous, and in the present day horses of the pure Turcoman breed are to be rarely found even in the Transcaspian province, or in Khiva. The Karabayer horses, distinguished for their excellent racing qualities, closely set form, and for endurance, are used only in the saddle; they have a long rapid stride, being able to go ten versts, and even more, per hour, and are most highly valued by the natives. But it is the Kirghiz horse that is most in use, and is of the greatest account throughout the country. Bred chiefly by the nomad Kirghiz, it is also to be found in large numbers in the oases. The Kirghiz horses are small, strong and thickly built, with great powers of endurance and speed, and among them many thoroughbred animals that at a quiet trot will go ten versts and more per hour. The Kirghiz horse serves equally well as a saddle and pack horse, has a firm foot on the narrowest mountain path, and will, even when the road is bad and it is heavily laden, make a hundred versts along the steppes, without resting and without feeding. Many facts might be cited in evidence of its endurance and speed. Thus for example, a native, being sent in 1868 from Samarcand to Tashkend with the news of a victory that had been gained at Choupan-Ata, did the journey of 280 versts in twenty-four hours on one horse. The Kirghiz horses are trained in kosacks, that is, in herds of brood mares and young horses with a stallion who occupies the place of chieftain in the kosack. They are kept the whole year in the open on green fodder, and their exposure to the harsh snowy winter often subjects them to distempers brought on by hunger. Among the settled population, horses are tended with the greatest care, and are fed with barley, lucern, and other fodder.

It is only for their working and draught power that horned cattle are prized, or have any great significance in Turkestan, inasmuch as their flesh is seldom used as an article of food by the natives. The settled population, instead of beef, eat mutton, and the nomads eat mutton and horse flesh. Milk products are of far greater importance, such as milk, cream, kaimak, cheese, and airan, a mixture of sour milk and water, used as a drink. The native cows, in most cases from being carelessly bred and tended, give but little milk, and for the same reason, the meat of horned cattle is very inferior to that of southern Russian cattle. The Kirghiz often use bulls for the conveyance of heavy goods, in arbabs, or packed on their backs, and they also employ them as saddle animals. Horned cattle in Turkestan are apparently of two breeds: in the south, a cross between the cattle of the place and the Indian humped zebu, *bos indicus*, and in the

east, almost pure Kirghiz breed. In the Transcaspian province, the cattle are small, and are bred in small numbers. In the high mountainous parts of the Ferghana province, in Alai and the Pamir, are to be found among the Kirghiz, though in no very large numbers, yaks (*poephagus gruniens*), invaluable animals for the transport of heavy goods, packed on their backs, over high steeps from 14,000 to 17,000 feet. They also give an excellent thick milk, from which the mountaineers make cheese.

Sheep breeding appears to be the chief branch of the live-stock industry in Turkestan, not only from the number of sheep bred, but also from the many uses to which the animal is put, for milk, meat, cheese, wool, skin et cetera. Sheep breeding on a large scale is restricted exclusively to the nomadic population, the Kirghiz and Turcomans. The oases, in which a settled population predominates, seem to be the central points for the use of mutton and the employment of sheep wool and skin in the manufacture of numerous hand made products, such as carpets of various kinds, felt, ropes, sacks, bags, tissue stuffs, skins, chamois, et cetera.

Sheep of the Kourduk breed are for the most part bred in Central Asia. They are remarkable for their power of endurance and also for the tastiness of their flesh, which, however, is somewhat fat, and for the huge excrescence of fat that grows during the summer on their hind quarters, and which during the winter failure of provender, serves the animal as a store of nutrition. Besides the Kourduk breed, in some parts of Central Asia are found the Karakul sheep, which gives a beautiful and valuable lamb wool. Karakul, to the southwest of Bokhara, in the khanate of Bokhara, is the principal place where they are bred. Sheep, like most domestic animals with the nomads, are kept the whole year in the open on green fodder, the consequence of which is that, notwithstanding they are strong and can support much, they suffer keenly and perish in large numbers from want of provender during the cold, snowy winter months. Sheep breeding is the principal occupation of nearly the whole Turkestan population, in consequence of the impossibility, from lack of water, of increasing the quantity of ploughed land; and there is every ground for believing that it will in the future be largely developed. Goats are bred in small numbers both in the steppes and in the mountains; their flesh serves as meat; they yield a valuable down; and from their skin, which is firm and durable, are made leatheren water and koumiss flasks, et cetera.

Among the nomads, camel breeding is an important branch of the live-stock industry, and though of late the introduction of railroads into the Transcaspian province has caused a considerable decline in their number, still even now the camel, by reason of its strength, endurance, and the ease with which it can be reared on any fodder, continues to be the sole means of transporting goods over the enormous steppes, and through the wastes of Central Asia. In Turkestan are to be found both single-humped and double-humped camels, the former being more highly valued on account of their strength and other superior qualities, but they are less able to support the winter cold. The nomads rear their camels somewhat differently than their other animals. As camels are very sensitive to the cold, rain, and damp in general, and are, moreover, unable of themselves to rake up fodder from under the snow, a store of winter provender, consisting chiefly of reeds and steppe grass, is laid up for them, besides which they are covered with blankets, and in general are tended with care and attention. It is whilst they are quite young, up to the second month after their birth, that they require the greatest care; in their fifth year they are counted to be full grown, and are able to

carry burdens of sixteen to eighteen pouds. Camels are used to transport goods in caravans, as well as to transport the property and families of nomads in their migrations from place to place, and they further give milk and wool; and also, though seldom, their flesh is used as a meat.

In the same way as the camel is the principal animal of burden in the steppe regions, the ass is of all animals mostly used in the oases for the purpose of transporting goods. It is, indeed, rarely to be found in other parts of the country. The native ass is small in size, content with almost any kind of provender, endowed with rare powers of endurance, and costs but little. For these reasons it is invaluable in the oases, and the poorest native finds little difficulty in getting and keeping one. It is of perpetual service to him, since he rides on it, uses it as an animal of burden for short distances, and finds it his best helper in nearly all his household occupations.

Owing to the peculiar climatic and soil conditions the forest industry in Central Asia has its special and distinguishing characteristics. The greater portion of Turkestan and the Transcaspian province consists of poorly watered, or completely waterless steppes and wastes, which, on account of their soil and climate, are unfitted for the produce of forest growths, and are consequently either altogether nude of trees, or else are covered with a few species of steppe bushes, corresponding with the conditions of the country and forming a kind of wild overgrowth. Real forests, or to speak more accurately, forest overgrowths, are to be met with only in the mountains, where, in the shape of separate groves and thickets, they partially cover the steppes, or are nestled in the defiles; and in either case are quite unlike the forests of European Russia. The various cultivated plantations, with which the oases abound and, together with the gardens, give them such a fresh green animated colouring, ought properly to be included among the forest acquisitions and wealth of the country. The bush and furze overgrowths, which are found here and there along the banks of rivers, where they flourish on the soil that is submerged during the overflow season, must also be included among its forest plantations. And thus, the whole forest wealth of Turkestan is composed of the following principal parts: a. real forests, which are to be found only in the mountains; b. steppe overgrowths of a few species of bushes partially covering the steppes; c. cultivated plantations on the watered soil of the oases. The exact extent of all these parts is unknown; but the figures may be taken as an approximate calculation of the space covered by real forests and steppe overgrowths as below:

	Syr-Darya Prov.	Samarcand Prov.	Ferghana Prov.
Mountain forests . . . . .	17,600 des.	129,400 des.	333,000 des.
Overgrowths on steppes and river banks	5,100,000 »	1,100,000 »	15,000 »

From the above figures it may be concluded that the forest region of the country covers 6,695,000 dessiatines, of which only 480,000 dessiatines come under the term of real forests, the remainder of the region consisting of sparse steppe bush overgrowths, a part of which, moreover, has been cleared and cut down. There are no statistics in reference to the Transcaspian province; but in productiveness and distribution of soil it resembles the three provinces of Turkestan, with this single point of difference, that in the Transcaspian province there are scarcely any mountain forests.

The mountain forests in the defiles and on the slopes of mountains in the Tien-Shan and Pamir-Altai chain, from 10,000 to 11,000 feet high, were formerly far more

extensive and reached down to the settlements in the oases; but the ruthless clearages to which they have for ages been exposed have effectually decreased their extent, and they are now confined to distant and almost inaccessible spots far removed from any centre of inhabited settlements. These mountain forests are composed of very varied species of trees and bushes, among which are most often to be found: the fir, *picea schrenkiana*, the dendroid juniper, *juniperus*, the apricot, the apple, the pear, different kinds of the poplar, the birch, *betula tianschanica*, the mountain ash, *sorbus tianschanica*, the walnut, *juglans regia*, the maple, *acer semenovi*, the pistachio, the field elm, the ash, the plum, the almond, the willow, et cetera. These trees are cut down partly for store timber, partly for fuel and partly for charcoal, of which a very large quantity is consumed throughout the country. The forest trees, moreover, furnish the population with a considerable quantity of wild fruits. The mountain forests, which generally cover the steep mountain slopes, whence most of the rivers take their rise, are of the greatest service to the country, in consequence of its peculiar climatic conditions. They not only strengthens, and bind together with their roots the spongy soil, and protect it from being washed away or injured by atmospheric influences, and at the same time prevent the destruction of the slopes and the formation of stagnant water beds, or avalanches, but they also influence the proportionate influx of water into the rivers, protect their sources, and in general fulfil the functions of preservers and distributors of atmospheric moisture which at the foot of mountains is of such importance in the due irrigation of the soil. It is for these reasons that the Government is now directing its serious attention to the preservation of these forests; and very successful attempts have been made to form forest plantations, without artificial irrigation, on mountain slopes where at present there are none.

The steppe overgrowths, which not so long ago covered the enormous stretches of steppe in Central Asia, have also been exposed to wholesale clearages, and it is only in places far removed from roads, rivers and settlements, that they preserve their ancient form and abundance. In their formation they are very varied and extremely characteristic in the typical productive forms of which these steppe overgrowths are composed. Warped, knotty branches and stems, a scanty grayish foliage, and sometimes a complete absence of foliage, and lastly, an organization entirely corresponding to the dry hot climate, these constitute the leading and distinctive characteristics of steppe overgrowths. They are made up of a variety of bushes: the saxaul or *haloxylon ammodendron*, *halimodendron argenteum*, *calligonum*, *pterococcus*, *ammodendron Karelini*, *tamarix*, *atraphaxis*, *lycium*, et cetera. Amongst these the saxaul, *haloxylon ammodendron*, is the most abundant and at the same time the most serviceable. Tough as whale bone, its wood makes excellent fuel, in consequence of which this shrub has suffered more than any other from destructive hands, and it is not to be found now in any of the principal settlements. The steppe overgrowths give nothing except wood for fuel. The amount of wood material obtained from a single plantation of forest overgrowth is not large, in consequence of the small growth of bushes, and the sparse manner in which they are grown. According to statistical returns for the Transcaspian province, not more than one-fourth of a cubic sagene of wood is gathered per dessiatine of steppe forest, and consequently enormous spaces have to be cleared and cut down before any considerable quantity can be collected. These steppe overgrowths are as serviceable to the

economic welfare of the country as the mountain forests, and play the same part as a space of dry land plays in respect to a forest growing on a mountain slope. With its wide extending roots the steppe overgrowth binds together and strengthens the sandy soil, shielding it from the wind, and preventing the formation of shift-sands, those plagues and scourges of Central Asia. The wholesale destruction of these overgrowths is already keenly felt in several parts of Ferghana, and more particularly in certain localities of Bokhara, where the moving sands each year advance farther, and encroaching on the oases, overwhelm with sand both gardens and even whole villages.

In view of the lack of wood in the country, the different kinds of rough prickly steppe grasses, *alhagi camelorum* et cetera, are of great value, and are everywhere gathered by the villagers for fuel. The so-called bank overgrowths, growing in the form of narrow strips along the banks of rivers, and consisting of different kinds of willows, *salix*, poplars, *populus diversifolia*, tamarisks, *tamarix*, marsh willows, *eleagnus*, and other species, also furnish considerable material for building purposes and for fuel.

In conclusion another very important branch of plant culture, artificial floriculture, and sowings, must be briefly noticed. These sowings are nearly everywhere practised on watered soils, in gardens not far removed from roads, canals, et cetera. They consist principally of the willow, *salix*, the poplar, *populus*, the field elm, *ulmus campestris*, and others, which, owing to the warmth of the climate and a sufficient supply of water, quickly reach full growth, and furnish wood for building, for manufactures, and for fuel. Plantations of the willow and poplar are, in particular, very numerous.

Having thus passed in review the general features of the rural industries and forest productiveness of Turkestan and the Transcaspian province, it will be necessary to dwell for a moment on the changes that have been produced in the economic conditions of the country by its annexation to the Empire, and the influence this distant frontier region may have on the economic life of Russia.

The annexation of Turkestan and the Transcaspian province to Russia has secured its south-eastern districts against the attacks of Asiatic nomads, and confirmed the rule of the Russians in the very heart of Central Asia; it has exercised a beneficial and important influence on the economic position of that country. The development of its industries, which had for centuries been shackled by constant internal dissensions, by the absence of any firmly constituted authority, and by many other like causes, has since the complete pacification of the country, been rapidly and surely advanced. The extent of cultivated land and the manufacture of rural industrial products have been in all directions greatly enlarged; improved labouring and manufacturing machines have been introduced and brought into use; the cotton trade by the replacement of the old native by the Upland species has already taken a leading place in the commerce not only of Turkestan, but throughout all Russia; sericulture, which had fallen so low in consequence of the spread of the silkworm rot, has again begun to revive, thanks to the timely measures adopted by the Government; new branches of industry, hitherto unknown in the country, have been established, such as, the manufacture and distillation of wine, beer brewing, fruit drying by ovens, the extraction of santonine from the seeds of the *artemisia contra*, which grows wild in many parts of Turkestan, and of which 572 pouds, to the value of 152,740 roubles, were ex-

ported in 1891, the manufacture of glass, the establishment of cotton-cleaning works and oil mills; the sanitary condition of its cities has been improved; successful attempts have been made to better the existing systems of irrigation and to water the barren steppes; and the foundations of Russian civilization have been firmly laid. And lastly, the opening of the Transcaspian Railroad in 1888, which runs 1,343 versts across steppes and wastes, uniting Samarcand, the heart of Central Asia, with the shores of the Caspian Sea, and consequently with the markets of European Russia, was an event of the highest significance and importance to Turkestan and the Transcaspian province. It has completely changed the trade and commercial route through all Central Asia. Previously, goods to and from Russia were conveyed in caravan across the steppes and wastes that stretch for thousands of miles between Tashkend and Orenburg, whereas now the former long, expensive and inconvenient route is almost abandoned, and goods are conveyed to Samarcand, the terminus of the Transcaspian Railroad. The traffic on this line, during the five years it has been opened, has already increased 110 per cent, and continues to grow. It will doubtless increase still more rapidly when the railway is carried on to Tashkend and Kokand, thus uniting in one network all the central points of Turkestan.

There can, then, be no doubt that this distant frontier region, when the system of irrigation, on which the attention of the Government is now concentrated, has been developed and improved, will be in a position to supply if not all, at any rate the greater part of the cotton required by Russian cotton mills, a large quantity of silk, a number of fruits, and other products of rural industry. In the Transcaspian province, where any considerable extension of properly irrigated lands is rendered impossible through the lack of water, the cattle-breeding industry (wool and hides) will continue to hold the first place; though even there, a by no means unimportant increase in the manufacture of cotton and silk, as well as in the preparation of fruits, may confidently be expected.

## CHAPTER XXII.

**Government Measures for the Protection of Rural Industries.**

THE first serious attempt to develop and protect the rural industries of Russia by means of direct Government measures was made in the reign of Peter the Great (1689—1725). The active interference of the Emperor, who brought his personal energy to bear on every branch of Imperial government, was chiefly directed to the extension of agriculture to the numerous parts of the Empire that then lay waste and idle, and to the introduction of the cultivation of new species of plants and domestic animals into the farming households. At a later period, the pursuits of the rural population were the object of special solicitude on the part of the Government throughout the reign of Catherine the Second (1762—1796). In those years the Government inaugurated not a few measures that were calculated to have a great influence on the future of Russian agriculture. Of these measures the most important was the law decreeing a general land survey and the establishment of fixed boundaries, by which the security of landed property was guaranteed, and the development of rural industries was placed on a firm and solid basis. Equally important was the invitation given to foreign colonists to come over and settle in Russia, with the object of bringing under cultivation the sparsely inhabited districts of the Empire, and of improving the primitive system of agriculture hitherto adopted by the native population. Among other measures designed to further the interests of agriculture must be mentioned the foundation in 1765 at St. Petersburg of the first economic agricultural association.

At that time there did not exist any central administrative authority over agricultural affairs, and the supervision of and care for the interests of the rural population were entrusted to the governors of the different districts. It was only towards the very end of the last century that an attempt was made to organize an administrative bureau of this description by the appointment in 1797 of a special department in the Senate, to which should be entrusted the direction and administration of the commercial resources of the Empire in general, and of the rural industries in particular.

When the different ministries were established in Russia in 1802, all affairs relating to rural industries were concentrated in the Ministry of the Interior, and continued

to be so till the year 1838. From that date, the Government began to act with better defined views of the method it should adopt in aiding and assisting the development of the rural industries; it took as its fundamental principle the rule that, from their very nature, these industries should never be the subject of governmental measures, and that its development can only be furthered by indirect means, that is to say, by the spread of useful information on all points connected with agriculture and farming, by supporting special private enterprises, and by removing every kind of obstacle that can impede its progress and general advancement.

In accordance with this program the Government, during the first thirty odd years of the present century, restricted the sphere of its activity principally to the transference into private hands for long terms and under certain prescribed conditions of vacant Government lands for the promotion of certain specially defined industries, such as the tobacco, silk thread, dyeing, and other, and the breeding of fine-wooled sheep which, thanks to these measures, the Government succeeded in introducing into southern Russia, on a very large scale. For the propagation of a theoretical knowledge of agriculture and farming, chairs of rural economy were founded at the different universities; and at the same time, to secure the propagation of a practical knowledge of the best way to keep and conduct a farming estate, an official paper, *The Agricultural Gazette*, began to be issued in the year 1834.

The sphere of Government activity in the interests of agriculture was greatly enlarged by the establishment, towards the end of 1837, of the Ministry of Imperial Domains. This Ministry had the charge of all affairs relating to rural industry, as well as the administration of the Imperial lands and forests, with the addition of a few other like functions.

A separate Department, which still exists under the name of the Department of Agriculture and Rural Industry, was attached to the Ministry for the superintendence of affairs connected with village farming. Three of the six sections into which the department is divided, are specially occupied with: *a.* the development of rural industry in general; *b.* the direction and management of agricultural schools and institutes; *c.* the compilation and collection of statistical returns. To the same Department is confided the administration of Government lands and the fishing industries. The yearly budget of the Rural Industrial Department amounts to 1,500,000 roubles. In close connection with this Department is the Scientific Committee of the Ministry of Imperial Domains, founded at the same time as the Ministry itself, for the preliminary revision and examination of the more important measures proposed for the improvement of rural industries. There are, moreover, three inspectors attached to the Department, whose duty it is: *a.* to aid in the development of rural industries in general; *b.* to superintend the direction of agricultural schools and institutes; *c.* to superintend the administration of the fishing industries. Such, in general terms, is the organization of the central administration of rural industries in Russia.

Council Boards of the Imperial Domains, and Agricultural Associations under the jurisdiction of the Ministry, are the acting local agents of the Ministry of Imperial Domains for the different provinces and governments of the Empire. There are at the present date forty-one such Council Boards of the Imperial Domains. Their authority extends over two or three governments, according to the quantity of Government forests and lands within the boundaries of the different governments. These boards are fre-

quently charged with the execution of various commissions, such as the furnishing of returns, the superintendence of the construction of agricultural schools, and other like matters.

The Agricultural Associations, which form a connecting link between the Government and the village landed proprietors, are of constant service to the Government in deciding important questions; and at the same time, they carry out on the spot, in case of need, the execution of administrative measures. The establishment of these agricultural associations dates from the end of the last century. In 1765, the first association of the kind, the Imperial Voluntary Economic Association was established in St. Petersburg. In the same century, in 1796, another of these associations, the Lithuanian Beneficent Economic Association, was founded at Yuriev (Dorpat). After this, like societies little by little began to be established in different parts of the Empire: such as the Imperial Moscow Rural Association, founded at Moscow in 1819; the Imperial Rural Association for Southern Russia, founded at Odessa in 1828; the Imperial Caucasian Rural Association, founded at Tiflis in 1850, and many others. The greater number of these societies confine their operations to the local interests of the province in which they are established; but some of them extend their operations to economical questions that touch the general interests of the Empire at large.

It is within the last thirty years, and since the emancipation of the serfs, that the number of these associations has visibly increased. Associations founded since that period have generally confined their sphere of activity within much narrower limits, to one single government or district, or to the development of certain definite branches of rural industry.

The capital at the disposal of these rural associations is made up of the contributions of members, the revenue accruing from estates belonging to them, and subventions granted by the Government and other institutions. The Government grant for extending their sphere of activity amounts to 30,000 roubles a year, not counting the sums advanced for the organization of exhibitions, and in aid of private enterprises. The rural associations serve to a certain extent as fixed local agents of the central rural administration; but from time to time the Ministry of Imperial Domains convenes rural congresses for the consideration of special and important questions. The reports of such congresses, which are sent in to the Agricultural Department, have a certain influence in the higher Government circles on the direction of affairs connected with the questions treated of in these reports.

With reference to cooperation on the part of the Government in the development of rural industries, it must be remembered that, up to the time of the emancipation of the serfs, although the Ministry of Imperial Domains undertook a series of measures designed to promote their improvement, it was impossible to carry them out in a satisfactory manner, so long as forced labour formed the basis of rural life. Apart from the emancipation of the serfs, the rural industries have been greatly aided by the construction within the last few years of a whole network of railroads, by which a quicker exchange of rural industrial products at home and of their export has been much facilitated.

The measures undertaken by the Government for the advancement of agriculture often demand a preliminary enquiry into its actual condition and state. To obtain trustworthy information on this primary point, the Ministry has had recourse

to different means and expedients. Thus, to make a full enquiry into the actual condition of agriculture and rural industry in Russia, a special Commission was instituted in 1872, under the immediate presidency of Count Walouev, then Minister of the Imperial Domains, and organized on the model of commissions in England of a like kind. Amongst others, representatives of the different Ministries, Imperial Domains, the Interior, Finance, and of Imperial Appanages, sat in the Commission. The Comission was authorized to summon persons of various callings and professions to give evidence, and to furnish any information that might be considered necessary and useful. Among the witnesses summoned were several governors, marshals of the nobility, presidents of landlord boards, landed proprietors, traders in rural industrial products, and many others. The commissioners issued their report in 1873, and it formed the basis of measures subsequently adopted.

In order to collect information on the actual condition of rural industries, the Agricultural Department, following the example of the United States, applies directly to village landed proprietors and farmers. The latter, in all from 4,500 to 6,000 correspondents at appointed periods, generally five times a year, forward to the Department information as to the grain and grass crops, cattle breeding, labour wages, the market price of rural products, changes made in the cultivation of land, and the actual condition of the various branches of rural industry. By this means, the Ministry of Imperial Domains, besides becoming directly acquainted with the position of agricultural affairs at any given moment, is further able to communicate such information to any institution or persons that may be interested in such questions. The Agricultural Department, moreover, publishes at different seasons of the year the following works on the subjects just mentioned: in the spring, a short preliminary return of harvest prospects, and later, fuller and more detailed returns on the same subject; in the summer, a short preliminary return of the hay and grain crops, and later, detailed reports of those crops; in the winter, returns of the prospects of the winter crops; and in the spring of the following year, an annual review of all agricultural operations during the last twelve months. The annual reports also include returns of home trade in rural products, with full information as to the actual condition of cattle breeding, the cultivation of special plants, and all like subjects that can be of interest, for the current year.

Besides the publications just mentioned, the Ministry from time to time sends query-papers to its correspondents, who thus supply information on various points connected with rural life in Russia. A digest of their answers, after careful selection and compilation, is published separately, containing most valuable data as to the different crops of grain, the state of the cattle-breeding industry, the cost of grain growing, the value of land, the labour question, and the like.

For the pursuit of such enquiries into the different branches of rural industry the Ministry appoints special expeditions, or commissions of chosen specialists: the results of all such commissions being invariably published for general information. Amongst the enquiries thus established the most noteworthy are: that of 1880 for investigating the breeding of fine wooled sheep, and that of 1883—1884 for investigating the breeding and sale of horned cattle. The first of these, enquiries was undertaken in consequence of numerous complaints on the part of farmers as to a decline in the breeding of fine-wooled sheep, one of the most important industries in southern Russia. The results of the enquiry were published in 1882—1886 in seven large volumes, under the

general title: *An Enquiry into the Present State of Sheep Breeding in Russia*. The enquiry into the state of cattle breeding extended over European Russia and the Caucasus, particular attention being paid to investigations as to races and breeds, and the importance of certain breeds in different localities of the Empire. Up to the present date, four volumes, containing the reports of the Commission, have been given out under the title: *An Enquiry into the State of Cattle Breeding in Russia*.

The measures undertaken by the Government upon its own initiative, and carried out in conjunction with the rural associations and provincial departments, may be classed under two great groups: 1. measures of a general character, relating to all the rural industries; 2. special measures, relating to some particular branch of rural industry. Among the measures of the first category must be included, the propagation by means of the press of information on all points connected with agriculture, the organization of exhibitions, the bestowal of prices and rewards, the grant of patents for new inventions, governmental improvement works, the canalization and irrigation of lands, the drainage of swamps, and other works of a similar character.

The propagation of useful information on agricultural pursuits by means of the press among the rural population of the Empire has been one of the principal aims, kept constantly in view by the Ministry of Imperial Domains. For this purpose, a weekly paper, *The Agricultural Gazette*, has been issued since the year 1834, and in 1841 the publication of a monthly magazine, now known under the title of *Farming and Forestry*, was commenced. In the *Agricultural Gazette* are published all the Government measures and laws that have any interest to those engaged in farming and land cultivation, as well as technical articles on the different branches of rural industry and trade, and miscellaneous news. The monthly journal contains critical reviews and notices of all questions bearing on the land and its culture, as well as accounts of new foreign inventions and discoveries that fall within the province of agriculture. Besides these two periodicals, there are issued by the Ministry numerous scientific and popular works on these subjects, and sums of money have been granted to private persons in order to cover their expenses in publishing useful works on agriculture and farming.

To bring before the eyes of the public the newest and latest agricultural inventions, the Ministry aids in the organization of agricultural exhibitions. The first exhibition of the kind held in Russia was opened in 1842, and for the following twenty-five years all such exhibitions were organized solely upon the initiative of the Government. They were at first held by turn in different governments, so that farmers and agriculturists living in the various governments might have an equal opportunity of profiting by them. For this purpose, European Russia was distributed into tracts each tract consisting of several governments in which, according to a previously arranged plan, an exhibition was alternately held year by year. At the same time, special rules were drawn up and issued for each separate exhibition, a plan that could not but be attended with certain inconveniences. To simplify the organization of future exhibitions a set of «normal rules» was sanctioned by the Ministry of Imperial Domains. According to these rules, exhibitions must be held in provincial capitals for a whole tract consisting of several governments. A grant of not less than 1,000 roubles is accorded to each of these exhibitions.

In the olden, ante-reform times, when farming in Russia could make no progress by reason of the prevalence of serfdom and forced labour, these exhibitions had no great influence on the pursuit of agriculture, or on the cultivation of land, nor had local populations any need of them; and consequently their organization and arrangement were exclusively the affair of the Ministry of Imperial Domains. Under the changed circumstances of the present day the use of these exhibitions is gladly acknowledged by all land cultivators, and nearly all local exhibitions are organized by rural associations and in part, by the Zemstva, the Ministry granting a money subsidy towards their organization and offering prizes and medals to successful exponents; the prizes for peasant exhibitors were generally improved agricultural implements and machines, or rewards in money. The amount of the subsidy granted naturally depends on the relative importance of the exhibition, and varies from 300 to 10,000 roubles.

Besides local agricultural exhibitions, universal Russian exhibitions are organized at certain intervals, the last of this kind of exhibition having been held in 1887 at Kharkov, with the active and immediate cooperation of the Ministry of Imperial Domains. From the year 1843 up to the present date more than 600 agricultural exhibitions have been held; and of late the average yearly number may be reckoned at twenty-five. Besides these, the Ministry has also taken an active part in the organization of Russian sections in the World Exhibitions that were held in 1851 and 1862 at London, in 1867 and 1878 at Paris, in 1873 at Vienna, and in 1876 at Philadelphia.

For the protection of different inventions and improvements in agricultural industries, patents are granted to the inventors of agricultural implements and machines, the necessary final certificate being granted by the Scientific Committee attached to the Ministry. During the last fifty years about 200 such patents have been granted.

Government improvement works have chiefly for their aim the amelioration of fertile soils that suffer in the southern and south-eastern parts of the Empire from lack of water, and in the northern and north-western districts from excess of moisture. The deficiency of water in the southern and south-eastern districts had long engaged the serious attention of the Ministry, the necessity of constructing irrigating works had been recognized, and attempts made to remedy the existing evil; but it was not till after the year 1870 that any systematic, continuous work was commenced. Even then the work was but tentative and carried out on a very small scale. The failures attending these first attempts proved the necessity of adopting an entirely new plan, if the steppe districts of Russia were to be regularly and systematically irrigated. According to this plan, which was drawn up in 1880, the climatic, soil and hydrographical conditions of the localities requiring watering were to be studied before any irrigation was commenced. With this object in view, it was proposed to make observations on the spring water level of the rivers and streams, to carry out general and special levelling works in the river and stream basins, to make borings in order to fix the depth of the deposits of the tidal layers, to trace the water sources, and to determine the extent to which the beds are permeated with water. In the meantime, whilst these investigations were proceeding, tentative irrigation works were already commenced, principally on Government lands or on contiguous tracts. In accordance with this plan the Ministry commenced the above mentioned preliminary investigations in the southern and south-eastern governments. On the count of the credit placed at the disposal of the Ministry to the sum of 500,000 roubles, the following hydrotechnical works were com-

menced, after the necessary preliminary investigations had been made: a regular system of irrigation from reservoirs was established by means of water conducting canals for the irrigation of 3,000 dessiatines of arable land, and further, through submergence by means of an artificial derivation of spring waters and other like expedients, about 4,630 dessiatines were irrigated. At the same time, and to test and prove the utility of the means adopted, trial sowings of cereals were made, with a regular supply of water to promote their growth. And if all the works just mentioned were not crowned with complete success, at least very satisfactory results were obtained. Thus, some of the reservoirs, besides fulfilling their original functions, served as plentiful water troughs. In consequence of all this, new villages sprang up in the steppes, and their inhabitants found it comparatively easy to carry out their ordinary and necessary farming operations. The speedy improvement in the fertility of the soil considerably raised the rent price of land. And lastly, it was now seen to be possible to grow different wood species in many of the watered tracts, and the new system of irrigation by means of the artificial derivation of the spring waters greatly facilitated the growth of field trees and plants.

If the development of farming was seriously impeded in the southern and south-eastern steppe localities of Russia by a lack of water, the larger portion of land in the northern and north-western districts of the Empire suffered, on the contrary, from an excess of moisture, through which it was converted into bog marshes. The Government was consequently called upon, in addition to the irrigation works already undertaken, to adopt some means of draining these swamp lands. Till the commencement of the last quarter of the present century, all such drainage works had been carried out very unsystematically, and in an extremely small way. It is only within the last twenty-five years that the drainage was undertaken on a large scale, and according to a strictly defined plan. For this purpose, two working parties were formed, one for the west, and the other for the north. The former was sent to the Polessie\*. From its geographical position, Polessie is one of those localities where agricultural operations can be carried on under the most favourable conditions. It extends over a space of 8,000,000 dessiatines, but scarcely a fourth part of this area is dry land fit for cultivation; 3,000,000 dessiatines are covered with swamp forests, scattered over the huge stretch of swamp in the shape of countless islands; and the remaining 3,000,000 dessiatines form one continuous open swamp, completely barren of all wood growth. Under such circumstances, even the two million dessiatines of dry land suitable for cultivation have in many respects lost their worth and value. The remaining 6,000,000 dessiatines render it extremely difficult to redeem and convert this stretch of land into arable fields, since the ways of communication are deplorably bad, and except in the winter, there are no roads at all across the bogs. But the unfavourable conditions of life in the Polessie are unfortunately not confined to these material losses. The prevalence of perpetual damp, and the putrefaction of vegetable matter that has been going on whole centuries in the swamps, the so-called bog fermentation, have developed every possible malady among the local inhabitants.

\* Polessie occupies an area which has the form of a triangle, at the corners of which lie the towns of Kiev, Mogilev and Brest-Litovsk.

On the swampy soil of the Polessie only those plants that are unfitted for fodder could grow, as reeds, bulrushes and sedge, and even this scanty vegetation was being perpetually choked and ousted by mosses. In places the bogs were completely bare, intersected with hillocks overgrown with meagre birch and pine. Only the higher parts of the swamps, and these only under exceptionally favourable circumstances, were during the summer covered with grass that gave a poor crop of hay both in quality and quantity; and bad as the hay was, it could only be gathered under the greatest difficulty. The mowers were frequently obliged to stand knee-deep in rusty water that caused them deep ulcers. All agricultural work in the Polessie was, therefore, extremely irksome and difficult. Cattle breeding, the basis and foundation of the farming industry, not only could not prosper, but perpetually declined, and agriculture could be practised only in the higher parts, in the very midst of the swamps.

It was, then, in the interests of field and forest culture that the Ministry resolved to improve the soil, and in part, the climatic conditions of the province by an extensive system of canalization. But before commencing the actual works, it was decided to solve these two essential questions: Was it possible to drain the swamps of Polessie? If possible, would it involve shoaling the navigable streams that flow in connection with these swamps? Concerning the Polessie swamps, the prevailing opinion was that, inasmuch as they had trifling descents and lay below the level of the contiguous streams, most of these streams also having very slight descents, the swamps themselves were in places of an unfathomable depth. Such an opinion, however, was proved to be erroneous by a number of experiments made in the way of levelling, sounding, boring and hydrometric measurements. On the other hand, the conclusions arrived at by meteorological specialists also tended to show the utility of draining the swamps. A general plan, based on the experiments that had been made in the year 1873, for draining the Polessie was, therefore, drawn up. It is necessary to remark that the drainage of certain parts of the province promised to give, within a very short period of time, extremely satisfactory results. In undertaking the task, the Ministry was particularly desirous to give its work from the commencement a demonstrative character, and to induce the local landed proprietors to take an active part in it. It was for this reason that the work was commenced in certain localities at an earlier period than had been originally fixed in the proposed plan. The labours of the working party in the western division of the province were, therefore, directed in part to the execution of the general plan of drainage, and in part to the separate drainage of defined portions of the whole. A commission of technical specialists was entrusted with the execution of the entire plan.

All the works carried out by the western commission may be thus summed up. Magistral and side canals were dug in Polessie for 3,312 versts in length, and along other parts of the swamps over a surface of 2,350,000 dessiatines. Wherever these canals were made, the soil was considerably improved, and enormous profits were guaranteed. Thus, 300,000 dessiatines of marshy swamp, formerly inaccessible, were converted into meadow land; 90,000 dessiatines of arable, kitchen and farming grounds, which were greatly injured by the wet, were redeemed, and now form splendid farming lands; 450,000 dessiatines of wood overgrowth, that suffered from perpetual overflow, are now covered with regular forest growths; about 470,000 dessiatines principally of valuable Government forest land, whose timber commanded no sale by reason of the distance from any nav-

igable spot, is now close to the banks of flowing canals; and the remainder of what once was mere swamp is now in every respect bettered and improved. The revenue of these dried lands steadily rises, and in some places is now twenty times what it was before. The expense incurred in draining the swamps, apart from the work of canalization, amounts to three roubles per dessiatine; but, if the entire distance of the lands influenced by the canalization be included, the expense incurred amounts to one rouble and fifty kopecks.

The work undertaken by the northern commission, in consequence of the different character of the land swamps, in the governments of Petersburg, Novgorod, Pskov, Olonets, Vologda, and a few others, could not be concentrated in one spot, as was the case in Polessie, but none the less, very satisfactory results were obtained. The drainage of the lands, as was to be expected, invoked the liveliest sympathy and cooperation on the part of the local residents, the forest, town, and rural associations; so much so, that even at the very start more than half the expense was covered by private persons and the country councils. The works taken altogether extended over sixty separate swamps, that covered a surface of 300,000 dessiatines. Of these, 75,000 dessiatines were by means of drainage converted from barren useless land into fertile forest land, and at the present date are covered with a most promising growth. About 14,000 dessiatines of barren useless land have been converted into pasture, meadow and arable land, whilst the remainder of the marsh is in what may be called a «swampy condition».

Among the swamps in Russia are to be found such as contain rich peat beds. During the last thirty-five years, in consequence of the development of the manufacturing and mill trades and the construction of a network of railways, the market price of wood fuel has considerably risen, and turf-digging has become a widely spread industry. The Ministry, therefore, directed its attention to an exploration of the turf marshes on Government grounds in the woodless central province of the Empire. The exploration showed that the above-mentioned peat beds contain fuel of an excellent quality. Upon the initiative of the Ministry, a turf storehouse with a steam engine for turf cutting was opened. In this storehouse technical specialists were apprenticed and taught. Now that peat digging has assumed considerable dimensions, an inspector over all affairs connected with this industry has been appointed by the Agricultural Department.

Among the numerous measures undertaken by the Government for the improvement of different branches of rural industry must be mentioned those designed to improve agriculture in the strict sense of the term. In order to increase the fertility of fields, which in many places were almost quite exhausted, from ill cultivation, the Ministry directed special attention to the wider use of artificial mineral manure. About the year 1860, the phosphorite beds to be found in the central governments of Russia were, by order of the Ministry, carefully explored, and it was discovered that beds of this material existed in great abundance, covering a space of above 20,000 square versts. But all attempts made to prepare phosphorite manure proved to be premature, as the majority of Russian farmers pretended that they derived no benefit from the use of such a fertilizer. A little later, the farmers of the Baltic governments, who were then introducing an intensive system of field culture, had recourse to artificial manuring, and following their example, the farmers of the neighbouring governments, Kovno, Pskov, Petersburg, and others, began little by little to use these fertilizers. Wishing to keep a constant store of artificial manure the Ministry, on the discovery about the year 1880 of enormous

beds of phosphorite, with a considerable admixture of phosphoric acid, in the governments of Podolia and Bessarabia, proposed that a duty of ten kopecks per poud should be laid on all dry phosphorite exported from Russia. At the same time, the Ministry made a whole series of experiments in the employment of phosphorite manure (superphosphate and flour of phosphite) both on Government farms and on the estates of some of the landed proprietors, who were supplied gratis with the manure. In places the experiments gave most satisfactory results, and they first led to the more general adoption of this manure. They also naturally caused an increased demand for flour of phosphite and superphosphate, and factories were founded for the preparation of these artificial manures. Within a very recent date a private company has been formed, with a capital of 1,000,000 roubles, for the preparation and sale of artificial manures in Russia.

The Ministry aided also not a little in extending the use of the best cereal seeds and fodder grass among Russian farmers. For this purpose, as means and opportunity permitted, it ordered these seeds from abroad, and then distributed them for trial sowings. Grants of money are also made to the rural associations and other establishments for the purchase of improved agricultural implements and machines; besides which, the best improved machines, chiefly ploughs and winnowing machines, are given as prizes at the different exhibitions to peasant exponents.

In the same way, and with the same object, the improvement of the cultivation of private lands, slips of the best sorts of hops, cotton, tobacco and other seeds, are ordered from abroad and distributed among Russian farmers and landowners. And to increase the profits derived from the cultivation of fruit and kitchen gardens, their proprietors are made acquainted with the best and newest modes of drying fruits in ovens.

Russian agriculture and horticulture have of late suffered terribly from insects, to combat which different remedies and measures have been adopted and large sums of money have been expended. The Government has especially had to wrestle with the phylloxera, which made its appearance in Russia in 1880, at first on the southern coast of the Crimea, where it was introduced by diseased vines imported in 1873 from Erfurt. In 1881, the phylloxera made its appearance in the Caucasus, in the neighbourhood of Soukhoum, the source of the pest being the same as before, diseased vines imported from Erfurt. Two years later, this insect showed itself in the Kuban province, and penetrated into the Stavropol government and the Kubine district of the Baku government. In almost all these original hotbeds of the disease every trace of the pest has been destroyed. Later, in 1886, the phylloxera pest broke out in the government of Bessarabia, in the Kishenev, Sorok and Orgiev districts; the source of the disease being once more an already infected foreign nursery. But the most serious of these visitations was that of 1889 in the Koutais government, the very heart of one of the most important wine manufacturing centres in all Russia. The infected region stretches from Koutais to the foot of the Georgian-Imeretinsk chain of mountains, altogether 50 versts in length and 18 versts in breadth. The source of this visitation has never been accurately traced. In order to localize the pest as far as possible, the following measures were adopted: a. to forbid the importation from abroad of all vines, tobacco pipe tubes, garden earth, and other objects that were likely to bring the phylloxera with them; b. to regulate the conditions of all sales or transports of vines in the prov-

inces of the Empire. Committees, composed of specialists, were appointed to see that immediate measures were taken to extirpate the phylloxera in vineyards already infected; besides which, congresses were held from time to time, to which entomologists and representatives from establishments formed for the extirpation of the phylloxera were invited. Proprietors of the larger Russian vineyards also took part in these deliberations. Till a comparatively recent period, and so long as the disease was limited to a few districts, the so-called radical method of combatting the insect was adopted. This method is simply to destroy all the infected vines. But when large tracts of the Crimea were found to be seriously infected, it was determined to adopt the more rational method of curing the diseased vines. To carry out the necessary operations, a station has been established in the Caucasus, and several nurseries have been opened with the object of deciding to what extent American vines can be imported for the purpose of restoring the infected vineyards to their former fertility.

The Government has spent altogether up to the present date in this combat with the phylloxera 1,300,000 roubles.

The attention of the reader must also be directed to the efforts made by the Ministry of Imperial Domains to improve the cattle-breeding industry. These include: a. ordering from abroad breeding cattle, and distributing them on certain conditions among Russian farmers for the improvement of the native stock; b. granting prizes for improvements that have been made in cattle-breeding in some parts of Russia; c. encouraging and furthering the sale of cattle in various forms in the markets abroad; d. adopting the best preventative means against cattle murrain; e. improving in various ways dairy keeping. When a farmer or landed proprietor receives from the Ministry breeding cattle, it is on the condition that at the conclusion of a fixed term, generally five years, he shall place at the disposal of the Ministry, for every two or three heads of cattle he may have received, one head of cattle bred from the foreign stock, the latter being sent on to some other farmer. By this means a gradual increase in improved races of cattle was expected to be secured. It is, however only just to add that no satisfactory result has attended this measure. Although the police sanitary inspection of cattle lies within the province of the Ministry of the Interior, in whose service a number of veterinaries are engaged, the Ministry of Imperial Domains takes an active part in deciding what preventative measures are to be adopted against cattle diseases. Nor must it be forgotten that, as early as 1853, the Ministry of Imperial Domains ordered measures to be taken for inoculating diseased cattle, and thus deciding what effect the vaccine had. A full report of these interesting experiments which, thanks to M. Pasteur, have in our days attracted such universal attention, was published in 1854. About the year 1880, the Ministry sent some specialists abroad to study the Pasteur method of applying vaccine to domestic animals. Fresh experiments in preventative inoculation were made by these specialists on their return to Russia, and the necessity of making further and more detailed investigations was adequately proved. For the better organization of such experiments the Ministry established at Kharkov (an important district for cattle and sheep breeding) a bacteriological laboratory, which is under the direction of the local veterinary institute. In general, these experiments have been attended with interesting and satisfactory results.

For the improvement of dairy keeping, besides granting subsidies to schools connected with the milk industry, the Ministry has aided the propagation of a practical

knowledge of the subject by means of ambulatory butter churners under the superintendence of experienced specialists. At the present moment, four ambulatory butter churners are at work, and from the year 1886, when they were first brought into use, have been the means of familiarizing numbers of peasants with the best methods of churning butter.

Notwithstanding the large number of cattle slaughtered and the general cheapness of live-stock in Russia, its export has always been very limited. Knowing that an increase in the foreign cattle trade must have a beneficial influence on cattle breeding, the Ministry has persistently adopted measures likely to attain this result. Among these measures may be mentioned, its cooperation in promoting the export of live sheep to France. After long negotiations with the French Government, the Ministry succeeded in organizing a sale for cattle, of which large numbers are now conveyed through Marseilles, Havre, Dunkirk and Rouen. At the same time measures were adopted to enable the country farmers of Russia to send salted pork to the foreign markets. This was done with the intention of increasing the use of the cheaper kinds of grain as feed in the preparation of the more valuable meat product. To promote a practical knowledge of salting pork for sale in the foreign markets, the Ministry founded a model salting house on the plan of those existing abroad.

Sericulture occupies in the southern provinces of the Empire (in the Caucasus and in Turkestan) no unimportant place among the breeding industries. This branch of industry, which had always brought in a considerable profit to the population, received a serious blow when, some thirty years ago, a general epidemic broke out among the silkworms in Russia. To combat the disease, and at the same time to develop sericulture, the Ministry founded in Tiflis, in the Caucasus, a silkworm breeding station with branch establishments. The object of these stations is to familiarize the population with a rational mode of breeding silkworms, and to supply the breeders with healthy cellular eggs, the surest and almost the only means of curing the silkworm rot.

The Ministry also busies itself with protecting and developing the native fisheries. Although the Russian fishing industry is enormous, it nevertheless is mostly confined to the extreme southern, south-eastern, and northern borders of the Empire. For this reason, the Ministry has adopted a number of measures calculated to increase the stock of the more valuable species of fish in the provinces of central Russia.

With this object in view, the Ministry has undertaken the supervision of the Nicholas Fish-breeding Stores in the Demyansk district of the Novgorod government. These stores are charged with the following duties: a. to cooperate with private persons in stocking ponds by means of selling at the lowest possible price the fecundated spawn and milt of the more valuable species of fish; b. to provide means to those who wish to learn the practical art of fish-breeding; c. to investigate and examine the different scientific and technical questions relating to breeding and catching fish. Besides this, in order to familiarize the public at large with the various methods of breeding fish, lectures with demonstrative illustrations are frequently given at the Imperial Museum of Rural Industries in St. Petersburg.

It is evident from the short sketch that has just been given of the different measures adopted for the improvement of rural industry, that all its branches have received due attention from the Government. It of course will be understood that the character and extent of the Ministry's activity depend firstly, on the material resources at its disposal, and secondly, on the general conditions of Russian life, and the degree to which

the peasant population has become cultured and intelligent. Nor do these measures embrace the whole activity of the Ministry on behalf of Russian rural industries. For it would be unjust to pass entirely over the part it takes in preparing legislative measures, and in considering the numerous questions referring to rural industries, but the solution of which lies within the province of some other governmental department; among such problems may be mentioned, questions of credit, the drawing up of distance-plans for new railways, the regulation of rural works, railroad and custom tariffs.

#### MEASURES ADOPTED BY ZEMSTVA AND RURAL ASSOCIATIONS.

Besides the Government, *zemstva*\*, in those governments where they exist, and rural associations have constantly busied themselves in all affairs relating to the development of rural industries in Russia.

In consequence of the varied conditions under which the industries of different governments exist, as well as the varied views taken by the different *zemstva* as to the best means of coming to the aid of the local industries, the activity of the *zemstva* in this province is necessarily exhibited in different ways. Some of the *zemstva*, turning their attention principally to the improvement of the rural industries, have formed special boards, under the names of industrial or economic councils, consulting committees, and commissions. They are composed, in addition to the three members of the board of landlords, of councillors chosen by the county council, the overseer of the provincial lands, in cases where there is such an official, and sometimes a few other persons, such as the director of the provincial industrial schools. The committee charges itself with the detailed investigation of all questions that may arise in connection with rural industries, with the administration of industrial institutes, such as schools, experimental grounds, nursery gardens and covering points, and the execution, within the limits of the authority conferred on them by the *zemstvo*, of different measures relating to rural industry.

Organizations of this kind already exist in connection with the *zemstva* of Moscow, Viatka, Perm, Orel, Kazan, Novgorod, Poltava, Simbirsk, and Kherson governments, as well as the Petersburg, Youkhnov, Staroruss, and some of the Moscow district *zemstva*.

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\* The *zemstva* are special bodies, existing in 34 of the governments, for the administration of affairs relating to the alimentation of the people; the maintenance in order of all ways of communication; the local post; the insurance of landed property; the educational, medicinal and charitable institutions; the fire stations; the protection of local agriculture, trade, and commerce; the protection of fields against insect, pests, et cetera. For the fulfilment of these duties the *zemstva* have their special budgets raised by taxes levied by them and contributions made in their favour. The *zemstva* act through county councils, consisting of persons possessing certain fixed property rights in a given locality, and who are called county council members, (*g l a s s n y e*), and the board of landlords, consisting of three members chosen from among the councilmen. The former propose measures; the latter see that these measures are carried out. In each district of a government there are district councils; but for all affairs relating to the whole government, there are government councils and government boards of landlords. It may be added that *zemstva* is the plural form of the word *zemstvo*.

From their character, the industrial measures proposed by the county councils may be divided into two groups: those relating to the propagation of agricultural knowledge among the population, and those designed to facilitate the introduction of some particular improvement.

Among the measures falling under the first of these categories must be mentioned the appointment of agricultural overseers (*agronoms*), who have been already attached to the Moscow, Perm, Viatka, Orel and Kherson government *zemstva*, as well as to some of the district *zemstva*, as in the Moscow and Smolensk governments. In general, persons thoroughly instructed and well experienced in all the branches of agriculture are appointed to the post of agricultural Government overseers; whilst the agricultural district overseers are usually chosen from among the pupils of middle agricultural schools. They are the immediate executors of orders given by a board of landlords or by an industrial council. The Perm and Kherson *zemstva* have the largest number of agricultural overseers in their service, namely, one for each district.

As an example of the duties fulfilled by these agricultural overseers, the functions of the Kherson overseers may be quoted. These include the instructing of the population in the construction and use of the newest improved agricultural implements and machines, and in the best mode of cultivating the soil; the introducing of the best system of field culture; the making the farmers acquainted with the best sorts of cereals and fodder grass, at the same time informing them where the seeds can be most conveniently and most cheaply procured; the executing of all orders for such seeds, and distributing them gratis among poor small farmers; the acquainting the population with the best breeds of cattle; instructing them in what places wells and ponds should be dug; the recommending of specialists for all hydrotechnical works; the giving of advice as to the culture of gardens and the planting of the best sorts of fruit trees; teaching the population the best methods of preparing milk products; giving technical advice to village handworkers; informing farmers of the central points for the sale of their industrial products; conducting the application of means against hurtful insects and Siberian mice, and the like.

Some of the *zemstva*, with the view of raising and spreading agricultural knowledge, have founded elementary schools for the study of the rural industries, the greater number of which are subsidised by the Ministry of Imperial Domains, whilst the Nizhni-Novgorod and Pskov *zemstva* have established rural industrial museums. As a kind of object lesson for the population and to acquaint them with the different improvements that have been made in field culture, and to show them the results, some of the *zemstva* have established experimental grounds. The Viatka *zemstvo*, for instance, has marked off for itself a whole network of such grounds, assimilating the culture of the soil to the ordinary conditions of peasant agriculture in the Viatka government. A large portion of these grounds is already realized. Other *zemstva* prefer to subsidise experimental grounds, which are laid out by the rural associations. The Poltava *zemstvo*, in particular, has in this respect rendered great assistance to the local rural industries.

In order to familiarize the population with the best methods of horticulture, many *zemstva* cultivate gardens on a large scale, and in every way assist in arranging and laying out gardens on village school grounds.

To the measures of the second category, designed to introduce various improvements and supply in general the wants of the farmers, must be referred, as being the

most important, the distribution of improved agricultural machines, the best kinds of seeds and mineral manures. The activity of the zemstva in this respect may be best seen in their acting as agents between the farmers and the manufactures of the machines they require. But many of the zemstva have opened machine, seed and fertilizer stores on their own account; whilst others undertake to order these articles. Almost all the zemstva who undertake these duties allow the purchasers of machines to pay by instalments, without any percentage, the zemstva themselves arranging the payment to the manufactures out of their own resources. In many governments, to secure a wider distribution of the best seeds among the peasant farmers, the seeds are given them in the shape of a loan to be redeemed, not in cash, but by the return of an equal quantity of seeds from the first crop, with a small extra quantity by way of percentage. The seeds thus returned are distributed the next year among other peasant farmers on similar conditions.

As an example of the extent to which such operations are carried on, it may be stated that the turnover capital of the Viatka zemstvo derived from orders made for agricultural machines amounts at the present date to 20,000 roubles. The Moscow zemstvo, from the same resource, has a turnover capital of 10,000 roubles, independent of the capital made in the same way by some of the district zemstva in the same government. The distribution of seeds as a loan among peasant farmers is practised on the largest scale by the Yaroslav district, and the Kostroma and Samara government zemstva; the first has within a short period expended on it more than 40,000 roubles; the second, 20,000 roubles; and the third, 14,000 roubles.

Another object on which the zemstva have expended much care and attention, is the improvement of draught horses. For this purpose, studs have been established, the breeders for which are principally let out by the Chief Department of the Imperial Stables.

It must be noted that in this hurried review only the principal measures have been mentioned and only the leading zemstva have been spoken of, whereas at different times measures of the greatest importance have been undertaken by other zemstva in the interest and on behalf of rural industries. Thus, for example, exhibitions have been opened; local rural associations have been liberally subsidised; soils have been explored; drainage and irrigation works have been undertaken; brood animals have been ordered from abroad for bettering the native stock; model and scientifically constructed beehives, forges, cheese factories, and the like, have been established.

As has already been said, the betterment of rural industries falls within the province of special rural and agricultural societies. The first in point of date, the Imperial Free Economical Society, was founded at St. Petersburg in 1765, since which date they have increased to the number of 120, with 51 branch establishments. Of these, 106 are devoted to the encouragement of rural industries in general; 28, to horticulture and the manufacture of wine; 1, to fruit culture; 13, to apiculture; 2, to cattle breeding; 4, to forest culture; 9, to fish breeding; 4, to bird breeding; 1, to milk products; 1, to acclimatization; 1, to sericulture, and 1, to pigeon keeping. There are, finally, 164 of these societies in European Russia, excluding the Caucasus; 3, in the Caucasus; 1, in the Central Asiatic domains, and 3 in Siberia.

These societies, besides the reports they issue and the conferences they hold on their special subjects, busy themselves, like the zemstva, with propagating scientific

knowledge among the people, and aiding the practical improvement of the particular industry they protect. They also constantly arrange exhibitions, open stores for the sale on commission of machines, seeds and artificial manures, and organize experimental grounds. Two of them, the Imperial Moscow Society and the Caucasus Society of Rural Industry, also maintain at their own expense, the first an agricultural and the second a horticultural school in Tiflis. The Ministry of Imperial Domains grants a subsidy to the Tiflis school.

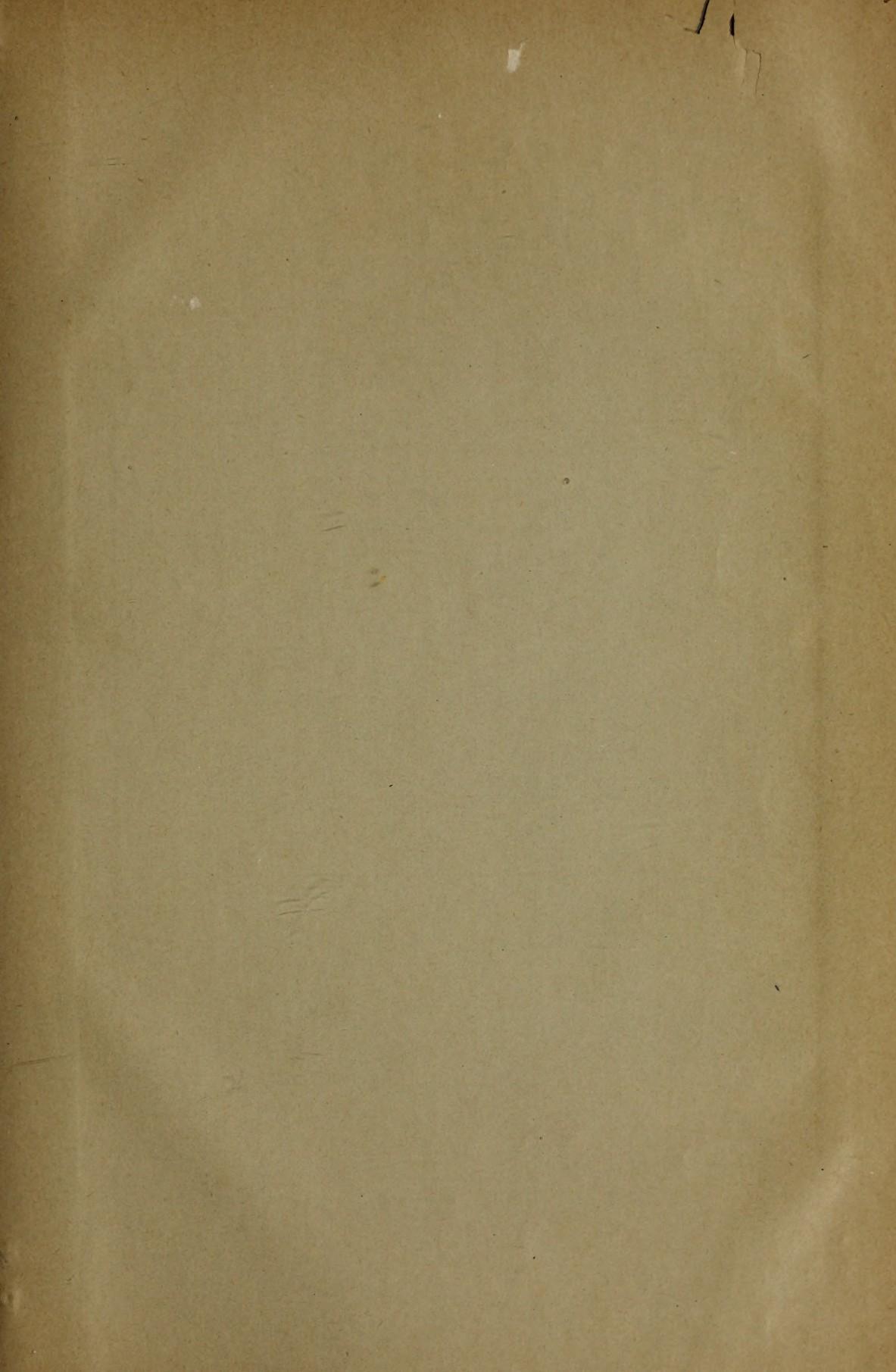
It will be understood that the sphere of the activity of these associations must be regulated by the means at their disposal. The elder societies, counting as they do a larger number of members, and having succeeded in amassing, thanks to contributions and other resources, comparatively large capitals, are consequently able to extend their operations more widely than societies whose capital consists solely of the yearly subscriptions paid in by their members.

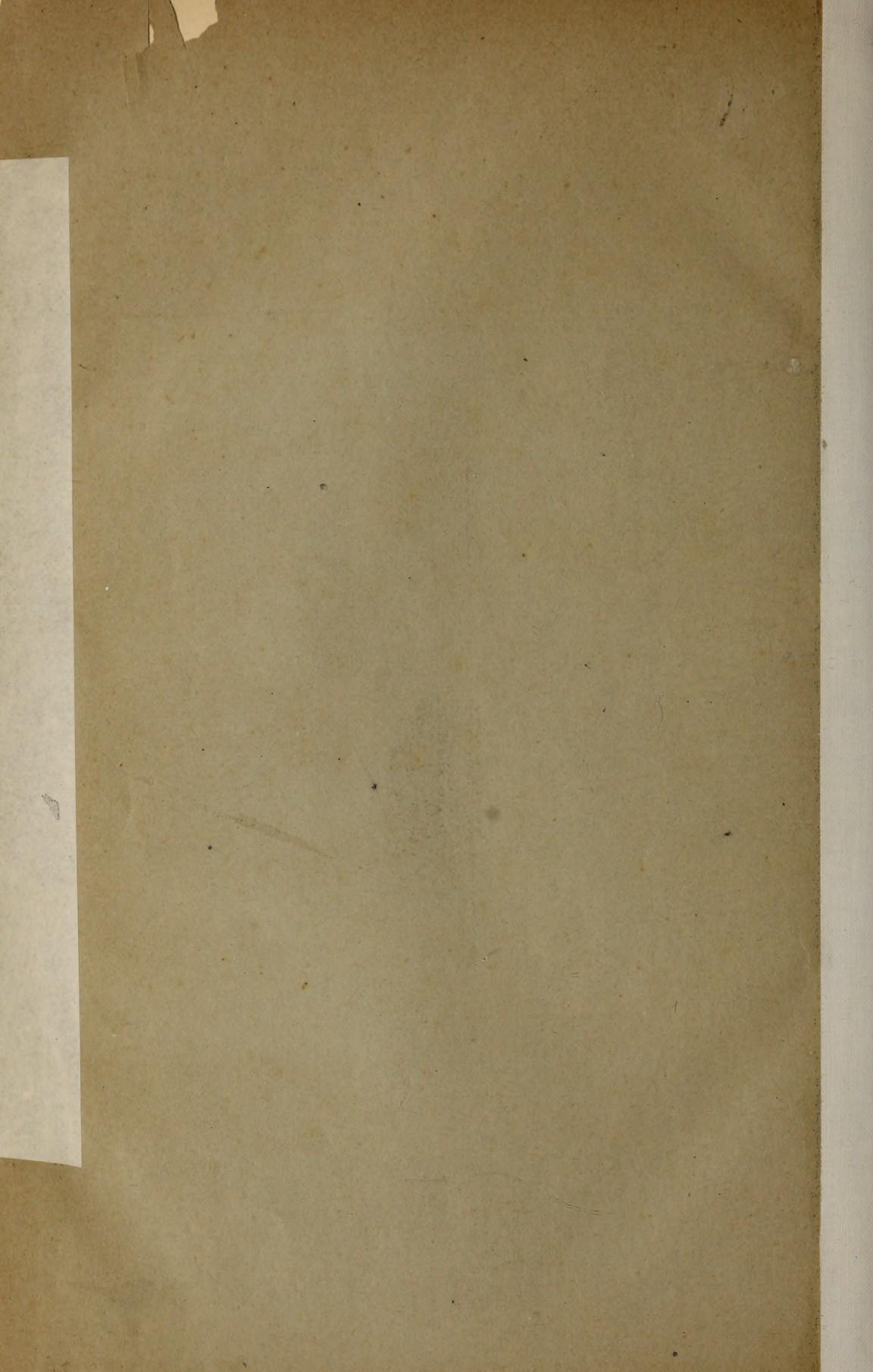


## E R R A T A.

In the table on page 126 under the rubrics of wheat and barley, instead of what is printed it should read:

M o n t h s .	W h e a t .		B a r l e y .	
	Higher	Lower	Higher	Lower
Than the average yearly price, in paper kopecks per poud.				
January . . . . .	1·0	—	2·8	—
February . . . . .	2·5	—	2·7	—
March. . . . .	3·8	—	1·7	—
April. . . . .	3·7	—	1·7	—
May . . . . .	1·9	—	2·6	—
June . . . . .	0·8	—	—	0·5
July . . . . .	1·1	—	1·1	—
August . . . . .	—	2·2	—	1·2
September. . . . .	—	5·3	—	1·7
October . . . . .	—	4·3	—	4·3
November. . . . .	—	1·8	—	3·0
December . . . . .	—	1·0	—	2·0
Yearly average . .	100·7		76·9	





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